THE MARINE REVIEW

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AMERICAN NAVAL STATION IN THE PHILIPPINES.

The United States government has decided to maintain a naval base in the Philippines, and work will shortly be started on it by J. G. White & Co., of New York city, who have been awarded a contract for the construction of a completely equipped naval coaling station, at Alongapo, on Subig bay, P. I. The present installation will constitute one of six units which will ultimately be built, providing a coal storage of 120 tons for the use of the U. S. navy. The initial unit will cost approximately $500,000, and will require two years to complete. Subig bay, about 75 miles north of Manila, is one of the finest harbors in the east. It was originally intended to establish a naval base at Cavite, but the board of army and navy officers decided in favor of Subig bay in preference to both Cavite and Guam. The harbor will be heavily fortified and it is estimated that it will require an expenditure of between $10,000,000 and $15,000,000 to carry out the work now proposed. A large part of the bay will be dredged to a depth of 35 ft., this being sufficient for the largest battleship in the navy.

The coaling plant will consist of apparatus for unloading coal from vessels or cars, and storing same, together with means for reclaiming the coal from storage and delivering it to vessels or cars again. A 50,000-gal. water tank will be located on top of a nearby hill and a pumping plant provided, to supply it with water from the Benictigan river, about 1.5 miles from the station. This water will be used for the fire protection of the coaling station, and to supply vessels.

The coaling unit about to be installed will be built upon a wharf 250 ft. long and 275 ft. wide. This wharf will be set upon clusters of piles which will be enclosed in concrete in order to protect them from the action of the teredo. The dock of the wharf is of steel and concrete.

BATTLESHIP RHODE ISLAND, BUILT BY THE FORE RIVER SHIP BUILDING CO., QUINCY, MASS. THIS PHOTOGRAPH WAS TAKEN FEB. 12, THE DAY SHE WAS DELIVERED TO THE BOSTON NAVY YARD. THE RHODE ISLAND WENT INTO COMMISSION FEB. 19.

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From the outer edge of the wharf a steel and concrete coal bunker will be erected, having a capacity of 5 tons of coal per running foot. It will be provided with chutes for delivering coal upon the deck of vessels or into cars. An electrically operated movable coal unloading tower, constructed of steel, will be operated on a track extending along the top of the coal bunker. It is designed for taking coal over from cars on the landward side of the wharf, or from colliers on the seaward side, and delivering this coal into the bunker or upon a conveyor which will carry it to the coal storage building. The conveyors will have a capacity of from 100 to 150 tons of coal per hour. The coal storage shed will be a 150 x 450-ft. steel structure with a concrete floor, and will hold approximately 15,000 tons. The enclosure will be divided by concrete partition walls, so that the greatest amount of coal in one pocket will be 600 tons, thus preventing the spread of fire. Electric thermostats will be located at 20-ft. intervals, and will ring an alarm in the office of the superintendent should the temperature of the coal rise above a fixed point. All of the conveyors and other apparatus for handling the coal will be electrically operated, and a power house of ample capacity will be installed adjacent to the coal storage building.

The unit to be erected immediately will be supplemented from time to time by other units of similar size and type, the wharves extending continuously along the bay front. Each wharf will accommodate a battleship, which can be supplied with 2,000 tons of coal in less than half a day. All of the coal used will be brought from the Virginia coal fields in tramp steamers, via Suez, at a cost practically of $8.00 a ton at Subig bay, as against $5.00 for Japanese coal and $5.50 for Australian coal. It is, however, of a considerably higher grade and better adapted for use under the marine boilers than those coals. In conjunction with the coal station, extensive marine and repair shops will be built, in which repairs of any kind can be carried out, and small cruisers and gunboats entirely constructed. Large floating docks will also be built to accommodate the largest vessels in the American navy.

DESIGN FOR A LIFE SAVING TUG.

Robert Moran, president of Moran Bros. Co., Seattle, Wash., has prepared plans for a life saving tug designed to minimize such occurences as the wreck of the Valencia. The letter has been sent to Senator Piles and transmitted in turn to President Roosevelt. The letter follows:

"Dear Senator: To my mind, one of the most, if not the most, important questions which should receive the immediate and united efforts of all our representatives in congress at the present time is that the United States government should provide with the least possible delay the most complete means for the preservation of life and commerce on the Pacific ocean and Straits of Juan the Fuca bordering on the North Pacific coast of the United States. The loss of the steamship Valencia last month and the appalling loss of life only tend to emphasize the necessity of the government taking adequate and energetic measures as will prevent as far as possible such disasters in future.

"As you are advised, at the present time there is practically nothing of that kind on the North Pacific coast excepting, perhaps, one or two inadequate and thoroughly worn out, unseaworthy, inefficient revenue cutters of absolutely no use unless it be to chase smugglers on the calm inland waters of Puget sound.

"The first question that occurs to the writer is how can this be most effectively done and at the least cost. Having given this matter considerable thought and being in a position from wide experience, both as a resident on the North Pacific coast for the past thirty years, a ship builder whose experience has covered both construction and repairs, and after mature consideration I am of the opinion that the best possible results in the saving of life and property can be accomplished by the United States government investing its money in a suitably designed and well-constructed floating life-saving station.

"I suggest that the government build a suitably designed life-saving vessel, not too large; a length not exceeding 150 feet would probably be found most suitable, though it is important that the vessel be built of steel, heavily framed and plated, and in the best possible manner throughout; to have a double bottom and the outside sheathed with heavy planking; fitted with suitable water-tight athwartship bulkheads; a main deck that can be made absolutely water-tight. She should be of the twin screw type; of ample power to act as a powerful tug boat to take vessels out of hazardous positions, and built to such a model as will give the greatest stability, high freeboard forward, completely inclosed and of such form as is best suited for lying at anchor against a heavy sea; pilot house low and most substantially constructed, and in every way the vessel built with the least resistance to the elements.

"A broad, fairly low main deck, aft, arranged for carrying a number of approved surf boats, one of these, at least, should be a swift gasoline engine-propelled launch. A very important part of the equipment of this vessel, and one which requires considerable detail throughout, is her 'ground tackle,' that is to say her anchors and gear, her capacity to hold on to the bottom in the most violent storms, and this, in my judgment, could best be accomplished by the most approved type of anchors, discarding the ordinary ships' chain cables and substituting in place of them the best quality, high grade steel wire rope; anchor cables should, in my judgment, be not less than one mile in length, that is to say, of such a length that it would be possible for the vessel to drop her anchors one mile from shore in a violent storm and by paying out cable, the vessel could be dropped shoreward as far as would be safe or necessary to accomplish the purpose, and I venture to say that there is no place on the North Pacific coast where a vessel such as is described above, fitted with proper 'ground tackle,' but what could let go anchor and hold herself in a definite position in the most violent weather that is ever experienced.

"The anchors and cables for such a ship should be so arranged and fitted that they can be 'let go' or 'housed home' in hawse pipes so that it would not require the presence of any member of the crew in an exposed position on the forward part of the ship. Special windlass gear would have to be provided for taking care of a long wire cable of this kind, though that is entirely practicable and is a detail. The gear should be so arranged and constructed that after the anchors were 'housed home' that the steel wire could be disconnected and entirely stored in a tank surrounding the drum, completely submerged in lime water to prevent corrosion.

"This vessel should also be fitted with a steel mast, short and of great stability, in connection with which there should be fitted a swinging crane for handling boats to and from the life-saving vessel and also carry the well-known life-saving breeches buoy and apparatus used in transferring people from the wreck.

"On the life-saving vessel which I propose I suggest that a suitably constructed crane of great stability be fitted not higher than is absolutely necessary to lift a boat from her chocks and land her in the water, and you will note by the attached sketch that as it is proposed to fit this boat she can be lowered away from either the starboard or port quarter or directly astern, and of course it

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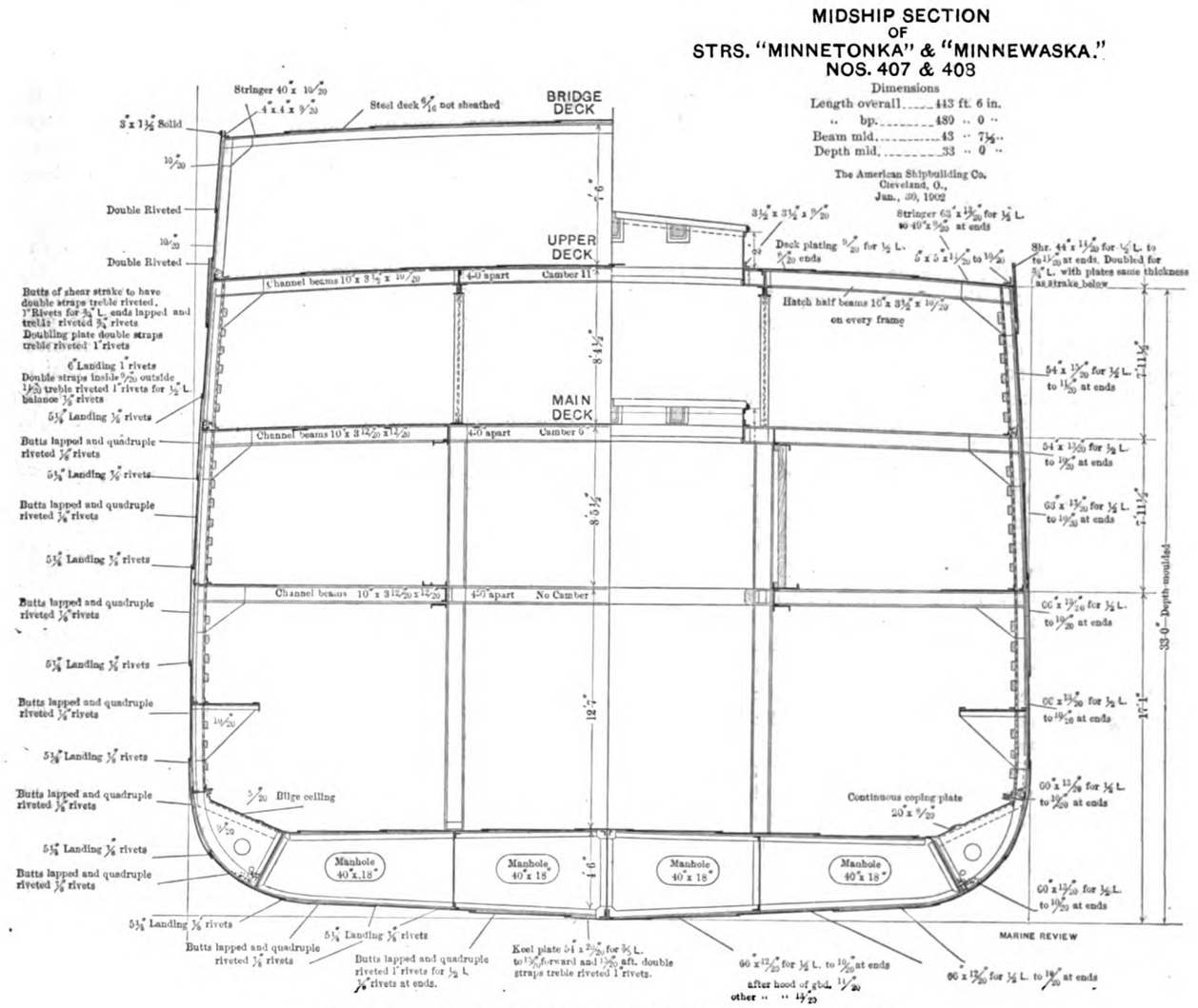
goes without saying that with such a single central lowering purchase, the boat can be swung around in the most suitable direction by means of guy lines, permitting the crew to have their oars shipped ready to pull away the instant the boat is water borne, arrangements being made to automatically release the boat from the crane as soon as she is afloat. This arrangement, as you will note, would permit the launching of a small boat from the most suitable point as to sea and other adverse conditions.

"On the top of this mast, above the crane, should be built a lookout platform and it should be fitted with a powerful searchlight so arranged that it can be swung over an entire circle. There should also be fitted on the top of this mast a powerful fog horn so arranged that it can be revolved continuously while blowing, also a powerful steam whistle of special sound and intensity, it being understood, of course, that this particular vessel would blow either the whistle or fog horn in such a distinctive manner as to number or duration of blasts that it would be understood by all mariners.

"Such a vessel as I describe would properly have what might be called a 'home port,' and in the instance of the entrance of the Strait of Fuca that it should be in Neah bay, that is to say, when the vessel was not actively engaged, in fair weather she would lie at a buoy in Neah bay and be connected at all times with the land telegraph line so that telegraphic instructions would reach her instantly and I would suggest further that a valuable and necessary auxiliary to such a ship would be a swift, seaworthy launch carrying wireless apparatus, and when the life-saving vessel left her anchor in Neah bay, this launch should take her place and connect up with the land telegraph line to receive further instructions and act as a dispatch boat to the principal life-saving vessel wherever she had gone. The expense of this auxiliary would be comparatively small and it would so greatly increase the usefulness of the main proposition that it should by all means be included."

LAKE SHIPS IN PANAMA TRADE.

The steamers Minnetonka and Minnewaska which were built in 1901 and 1902 by the American Ship Building Co. for salt water service, are now at the yard of the Newport News Ship Building & Dry Dock Co., Newport News, Va., undergoing conversion into oil tankers. These steamers,


MIDSHIP SECTION
OF
STRS. "MINNETONKA" & "MINNEWASKA."
NOS. 407 & 408
Dimensions
Length overall 443 ft. 6 in.
" bp. 439 " 0 "
Beam mld. 43 " 7½"
Depth mld. 33 " 0 "
The American Shipbuilding Co.
Cleveland, O.,
Jan., 29, 1902
BRIDGE DECK
UPPER DECK
MAIN DECK
Stringer 40" x 10/20
4" x 4" x 9/20
Steel deck 5/16 not sheathed
3" x 1 1/2" Solid
Double Riveted
Double Riveted
Channel beams 10" x 3 1/2" x 10/20
4-0 apart
Camber 11"
Channel beams 10" x 3 12/20 x 12/20
4-0 apart
Camber 6"
Channel beams 10" x 3 12/20 x 12/20
4-0 apart
No Camber
Butts of shear strake to have double straps treble riveted, 1" Rivets for 3/4" L. ends lapped and treble riveted 3/4" rivets
Doubling plate double straps treble riveted 1" rivets
6" Landing 1" rivets
Double straps inside 5/20 outside 1/20 treble riveted 1" rivets for 1/2" L. balance 1/2" rivets
5 1/4" Landing 1/8" rivets
Butts lapped and quadruple riveted 1/8" rivets
5 1/4" Landing 1/8" rivets
Butts lapped and quadruple riveted 1/8" rivets
5 1/4" Landing 1/8" rivets
Butts lapped and quadruple riveted 1/8" rivets
5 1/4" Landing 1/8" rivets
Butts lapped and quadruple riveted 1/8" rivets
5 1/4" Landing 1/8" rivets
Butts lapped and quadruple riveted 1/8" rivets
5 1/4" Landing 1/8" rivets
Butts lapped and quadruple riveted 1/8" rivets
5/20 Bilge ceiling
Manhole 40"x 18"
Manhole 40"x 18"
Manhole 40"x 18"
Manhole 40"x 18"
Continuous coping plate 20" x 5/20
Hatch half beams 10" x 3 1/2" x 10/20 on every frame
Deck plating 5/20 for 1/2 L. 5/20 ends
5" x 5" x 1 1/2" to 10/20
Shr. 44" x 12/20 for 1/2 L. to 11/20 at ends. Doubled for 3/4" L. with plates same thickness as strake below
54" x 12/20 for 1/2 L. to 11/20 at ends
54" x 12/20 for 1/2 L. to 10/20 at ends
63" x 12/20 for 1/2 L. to 10/20 at ends
66" x 12/20 for 1/2 L. to 10/20 at ends
66" x 12/20 for 1/2 L. to 10/20 at ends
66" x 12/20 for 1/2 L. to 10/20 at ends
60" x 12/20 for 1/2 L. to 10/20 at ends
Keel plate 54" x 2 5/20 for 3/4 L. to 12/20 forward and 1 5/20 aft. double straps treble riveted 1" rivets.
66" x 12/20 for 1/2 L. to 10/20 at ends
after hood of gbd. 11/20
other " " 11/20
66" x 12/20 for 1/2 L. to 10/20 at ends
Butts lapped and quadruple riveted 1/8" rivets
5 1/4" Landing 1/8" rivets
Butts lapped and quadruple riveted 1" rivets for 1/2 L. 1/8" rivets at ends.
MARINE REVIEW
Depth moulded 33'-0"

MIDSHIP SECTIONS OF STEAMERS MINNETONKA AND MINNEWASKA.

which exceed Canadian canal dimensions, were built in sections, towed through the canals and put together at Quebec. They were built by a syndicate of lake men who believed they saw an opening in the foreign trade of the United States, but who discovered later to their sorrow that no such opening existed. Each vessel made a trip around the Horn and was then put in ordinary at Brooklyn. They were bought in about a year ago by the American Ship Building Co., and were recently sold by Mr. James C. Wallace, president of the American Ship Building Co., to a company formed by Arthur Hill of Saginaw, Mich., and James Jerome of San Francisco. As soon as they are converted into oil tankers they will be chartered

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to the Union Oil Co. which has the contract for furnishing fuel oil for the dredges and other machinery equipment along the line of the Panama canal. The steamers will run from the California oil fields to the Panama canal zone.

Both of these vessels were built at Cleveland under the supervision of Lloyds, Mr. A. C. Heron who is now at Nagasaki, Japan, representing the classification society. The ships were of the general ocean type and were designed to have a deadweight capacity at 25 ft. 6 in. draught of 7,000 gross tons cargo and 700 tons bunker fuel. Their general dimensions which were dictated as far as beam is concerned, by the width of the Canadian canals, are as follows:

Length over all	443 ft. 6 in.
Length between perpendiculars	430 ft.
Breadth, molded	43 ft. 7½ in.
Depth, molded to upper deck	33 ft. 6 in.

The steamers were built to the highest class (100 A) of the British Lloyd and were constructed under the three deck rules. They are exceptionally heavy in scantlings. A double bottom 4½ ft. deep on the cellular principle with solid floors at every frame extends from the collision bulkhead to the after-peak bulkhead, with a total capacity, including peak tanks, of 1,600 tons water ballast. The upper and main decks are laid complete, but the lower deck was not completely laid, having open spaces between beams to facilitate the stowage of cargo. The forward hold was divided into three compartments by two watertight bulkheads, the after compartment forming an auxiliary bunker and connected to the stoke-holds by tunnel through the permanent bunkers and watertight door in bulkhead. The after hold was divided into two compartments, making five compartments all told, with cargo capacity for 360,000 cu. ft. There were nine 14-ft. hatches, affording exceptional facility for the rapid discharge of cargo. The cargo-handling gear consisted of four short steel pole masts each fitted with four large derrick booms. A double cylinder steel winch was installed for each hatch.

The steamers were equipped with triple-expansion engines with cylinders 27, 42½ and 73 in. diameters by 48 in. stroke. The high pressure cylinder only is fitted with a liner. The cylinders were arranged from forward in the order of high pressure, intermediate and low pressure. The high pressure and intermediate valves: piston and double-ported slides respectively, were placed between these cylinders, and the low pressure double-ported slide valve is between the intermediate and low pressure cylinder. The bed-plate is in three pieces, bolted together and contains six main bearings, 14 in. diameter and 14 in. long, lined with white metal in cast iron circular bushings. The condenser, which is in cast iron, rectangular section, extends about two-thirds the length of the engine at the back, supporting on its top two of the back columns. It contains 3,120 sq. ft. of cooling surface made up of ¾-in. brass tubes. The circulating water is pumped twice through by a 12-in. centrifugal pump driven by an independent engine. The three front and forward back columns are of the inverted Y pattern, allowing free access to crank pins and bearings. The piston rods are of steel 6¾ in. diameter and the connecting rods are 10 ft. between centers. The crank shaft, which is in three interchangeable parts 14 in. diameters, is of forged steel with wrought iron crank arms. The crank pins are 14 in. diameter by 15½ in. long. Tunnel and propeller shafts are of forged steel 13¾ in. and 15¼ in. diameter respectively, the latter being protected in a stern tube by a continuous liner. This liner is shrunk on in five lengths, the ends of which are fused together by the pouring of molten brass over the joints. The valve gear is Stephenson double bar link motion throughout, the reversing engines being of the direct-acting type.

The air pump is of the vertical single-acting type, driven from the low-pressure crosshead and fitted with bronze disc valves. Two feed and two bilge pumps are also driven from air pump crosshead, the feed pumps taking water from the hotwell and delivering to the feed heater, which is of the Worthington type from whence the feed water gravitates to the duplex vertical Blake main feed pumps by which it is pumped to the boilers through an oil filter. The donkey and ballast pumps are Blake vertical duplex type, the latter being arranged so that it may be used as a circulating pump. The donkey boiler and evaporator feed pumps are horizontal duplex. The main steam pipe is of 9-in. lap-welded iron with riveted cast steel flanges, the connections to the fore boilers being made of small drawn copper tubing with suitable expansion bends and slip joints. Auxiliary steam and exhaust pipes are copper and bilge suctions lead.

The main boilers are four in number, of the Scotch type, 12 ft. mean diameter by 11 ft. 6 in. long, with a working pressure of 170 lbs. per square inch. Each has two Morrison interchangeable furnaces of 44 in. mean diameter with separate combustion chambers and 226 tubes of 3 in. diameter. The total grate surface in the four boilers is 148 sq. ft. and the heating surface is 6,900 sq. ft. The boilers are fitted with Howden draft with a large single fan and belted engine. The donkey boiler, intended to supply steam for the nine cargo winches, is of the Scotch type 10 ft. 6 in. diameter by 10 ft. 6 in. long, with two 40-in. furnaces and 158 tubes of 3¼ in. diameter. It is placed above the main boilers on the upper deck and connected to the forward main funnel. The propeller is of cast iron 18 ft. 6 in. diameter by 17 ft. pitch with 94 sq. ft. of surface on four removable blades. Both steamers are lighted completely throughout by electricity.

Both ships are well built and proved entirely seaworthy in extremely heavy weather.

CHARLES T. HARVEY ON THE SAULT CANAL.

Mr. Richard P. Joy, of Detroit, sends to the MARINE REVIEW a letter from Mr. Charles T. Harvey to his father, James F. Joy, dated April 18, 1855, concerning the actual date of the completion of the first canal at Sault Ste. Marie. The letter has a certain interest also in expressing Mr. Harvey's opinion of the Sault itself. The letter is as follows:

"I beg leave to inform you that the excavation work (proper) on this canal was completed on the 8th inst., that the water from Lake Superior was let in on Tuesday the 10th and after a week's trial of the water at full level everything seems to be right. At all events Col. Glenn, the state engineer, says he is perfectly satisfied. We could today pass any of the lake vessels through the entire canal by spending some labor in removing ice around the lock gates not yet thawed off.

"I expect to get all the surface work remaining about the canal done by the 1st proximo and have already discharged a portion of my men. The dredging which will then alone remain unfinished now bids fair to be done in good time. We might hope to get it done by about the time the first boats get here were it not that the chief engineer has prohibited us from passing anything through the canal till he gets here. We want to get the dredge from one end to the other before we can make a finish. I hope the directors will soon show themselves here and allow me to leave this miserable hole of a place. Very truly,

"Your Obedient Servant,
CHARLES T. HARVEY.

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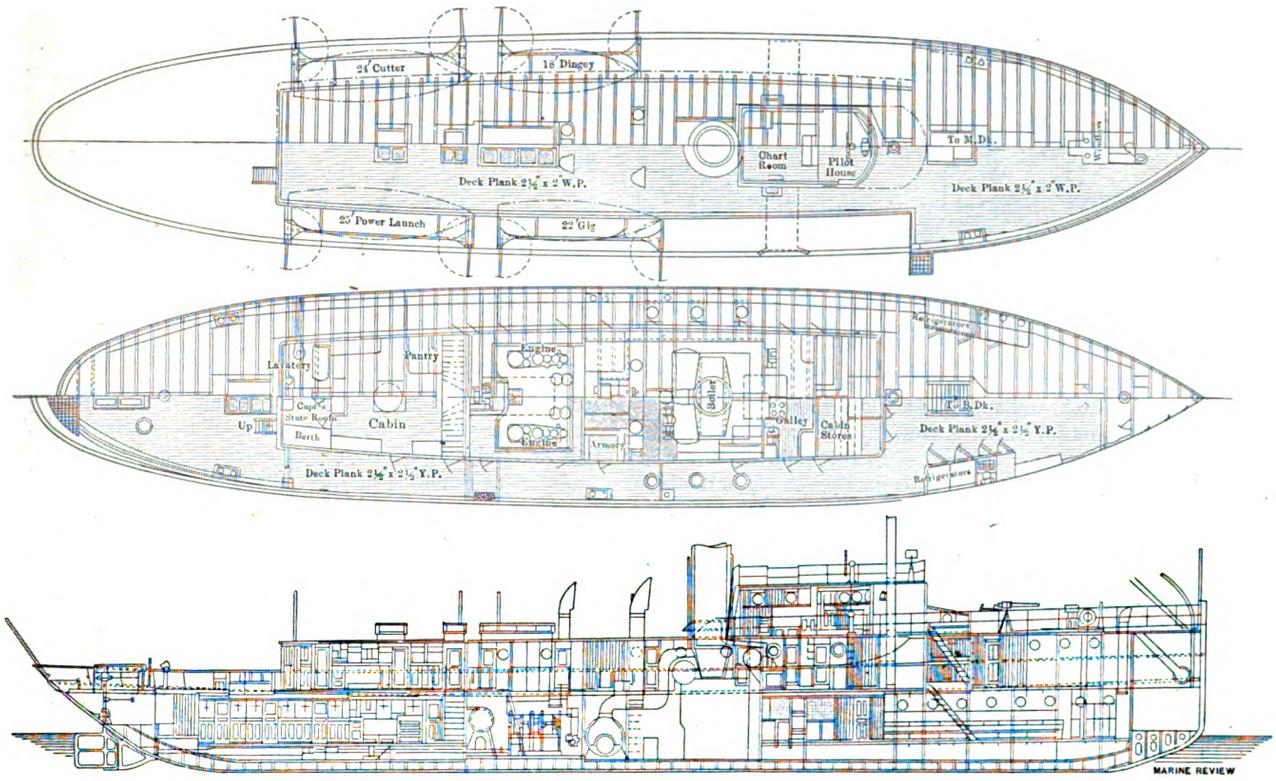
United States Revenue Cutter No. 15.

An act of congress approved Jan. 12, 1905, authorized the construction of a steam revenue cutter for service in the waters of Albermarle and Pamlico sounds, on the Carolina coast, at a cost not to exceed $175,000. The waters in these sounds being very shoal, the draught of the vessel would necessarily have to be small, and a board of officers of the revenue cutter service was appointed to consider



PROFILE AND DECK PLANS, REVENUE CUTTER NO. 15.

the subject, and submit a report with recommendations as to the proper dimensions for a vessel suitable for the duty required.

From the report of this board the lines for the hull of a twin screw, light draught steel vessel, were drawn, and a model was constructed and "pulled" in the tank at the Washington navy yard. From the data of these tank trials, the requisite horsepower was decided upon, and plans and specifications for the construction of the hull and machinery were drawn up, printed and issued in January, 1906

The vessel, to be known until launched as Revenue Cutter No. 15, is to be of steel, of about 408 tons displacement, with one mast, one funnel, a flush main deck, an interrupted berth deck, and a deck house with a top gallant forecastle extending aft to the forward end of the deck house.

The principal dimensions of the hull are as follows:

Length over all	158 ft.
Length between perpendiculars	148 ft.
Depth from base line at side, amidship, ...	10 ft.
Spring of beams in 30 ft., ...	7½ in.
Breadth of beam, molded, ...	30 ft.
Draught of vessel with 25 tons of coal and 2,400 gallons of fresh water, stores and provisions, ready for sea, ...	5 ft.
Displacement at 5-ft. draught, ...	408 tons.

The hull is divided into six compartments by five water-tight bulkheads. On the top gallant forecastle is located the steam windlass engine, anchor davits, and a 6-pounder rapid-fire gun. From this deck a hatchway and ladder afford access to the main deck. The top gallant forecastle deck extends aft to the top of the deck house, thus forming a continuous deck, affording protection to the main deck forward. The pilot house and chart room are located on the forward end of the deck house, the top of the pilot house being extended forward and out to the sides of the vessel to form the bridge. On the bridge and in the pilot house are installed the steering wheels, engine room telegraphs and bell pulls, binnacles, etc., and on the forward end of the bridge is a searchlight, or projector, and the telephotos keyboard. On the main deck under the top gallant forecastle, beginning forward, are located a paint locker, shower baths for the crew, carpenter's work bench, water closets for the warrant officers and crew, and the refrigerators for the vessel. A hatch and ladder afford access to the berth deck. In the deck house are the following rooms: A lamp locker, three storerooms, the galley, the armory, the upper fire room space, the engine room, the ward room entrances, and the cabin of the commanding officers.

On the berth deck forward is the prison, the crew's space, hatches to the main hold, and rooms for the warrant officers; the berth deck is interrupted by the fire room and engine compartments, and aft of the engine room bulkhead continues as the ward room deck. In the ward room space is the ward room country, an office, a pantry, six staterooms and a lavatory. Aft of the wardroom lavatory is the quadrant room. Below the berth deck, beginning forward, is a trimming tank, chain lockers, the main hold, and the fresh water tanks of 1,200 gallons capacity. Below the ward room deck are two water tanks of 2,000

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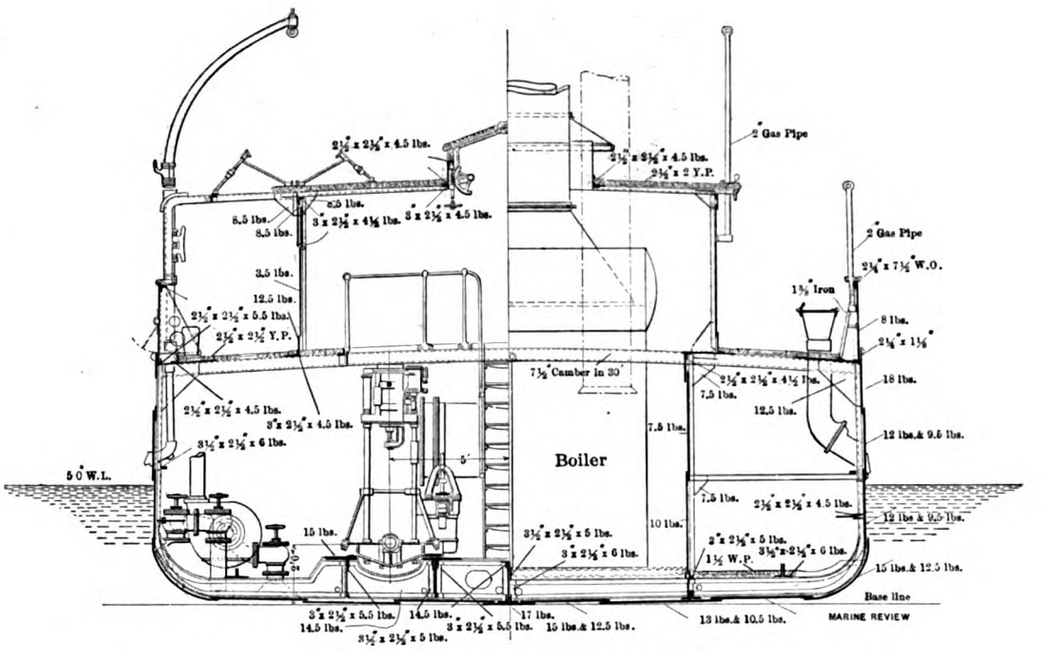
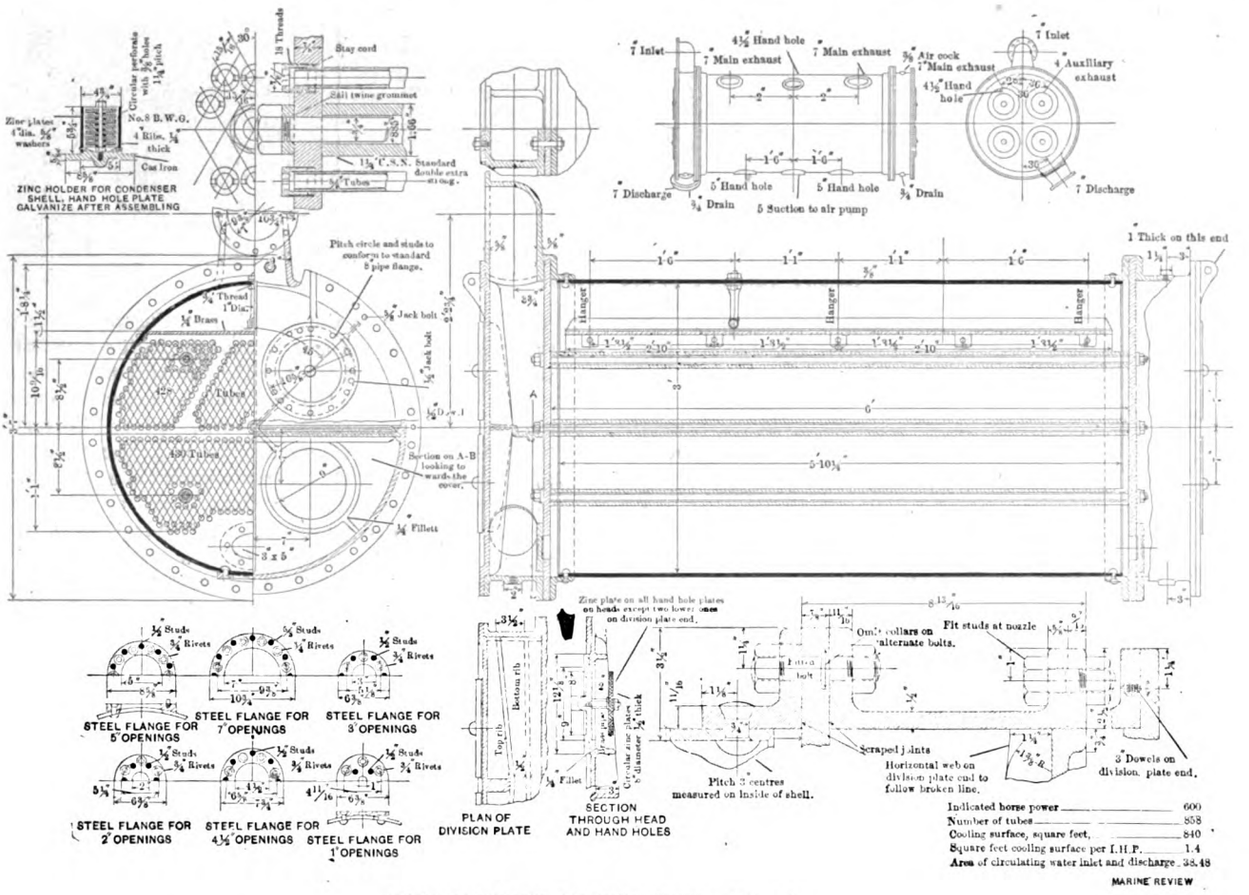


MIDSHIP SECTION REVENUE CUTTER NO. 15.

gallons capacity each, and an ordnance room; and aft of this space is a storeroom for small stores. On each side of the fire room compartment, extending up to the main deck, are the coal bunkers, of about 70 tons capacity. A water tank

vertical, inverted cylinder, direct-acting, type, each having one high-pressure cylinder, 8 in., one medium-pressure cylinder, 13¼ in., and one low-pressure cylinder, 22 in. in diameter, the stroke of all pistons being 18 in. The I. H. P. of these engines


ZINC HOLDER FOR CONDENSER SHELL, HAND HOLE PLATE GALVANIZE AFTER ASSEMBLING
STEEL FLANGE FOR 5" OPENINGS
STEEL FLANGE FOR 7" OPENINGS
STEEL FLANGE FOR 3" OPENINGS
STEEL FLANGE FOR 2" OPENINGS
STEEL FLANGE FOR 4½" OPENINGS
STEEL FLANGE FOR 1" OPENINGS
PLAN OF DIVISION PLATE
SECTION THROUGH HEAD AND HAND HOLES
Indicated horse power 600
Number of tubes 858
Cooling surface, square feet, 840
Square feet cooling surface per I.H.P. 1.4
Area of circulating water inlet and discharge 38.48
MARINE REVIEW

MAIN CONDENSER REVENUE CUTTER NO. 15.

of 2,500 gallons capacity is worked into the after end of each bunker.

MACHINERY.

There are two triple-expansion propelling engines of the

will be about 600 when making 220 revolutions per minute. The main valves are of the piston type for each engine, all worked by Stephenson link motion with double bar links. Each main piston has one piston rod with a cross-

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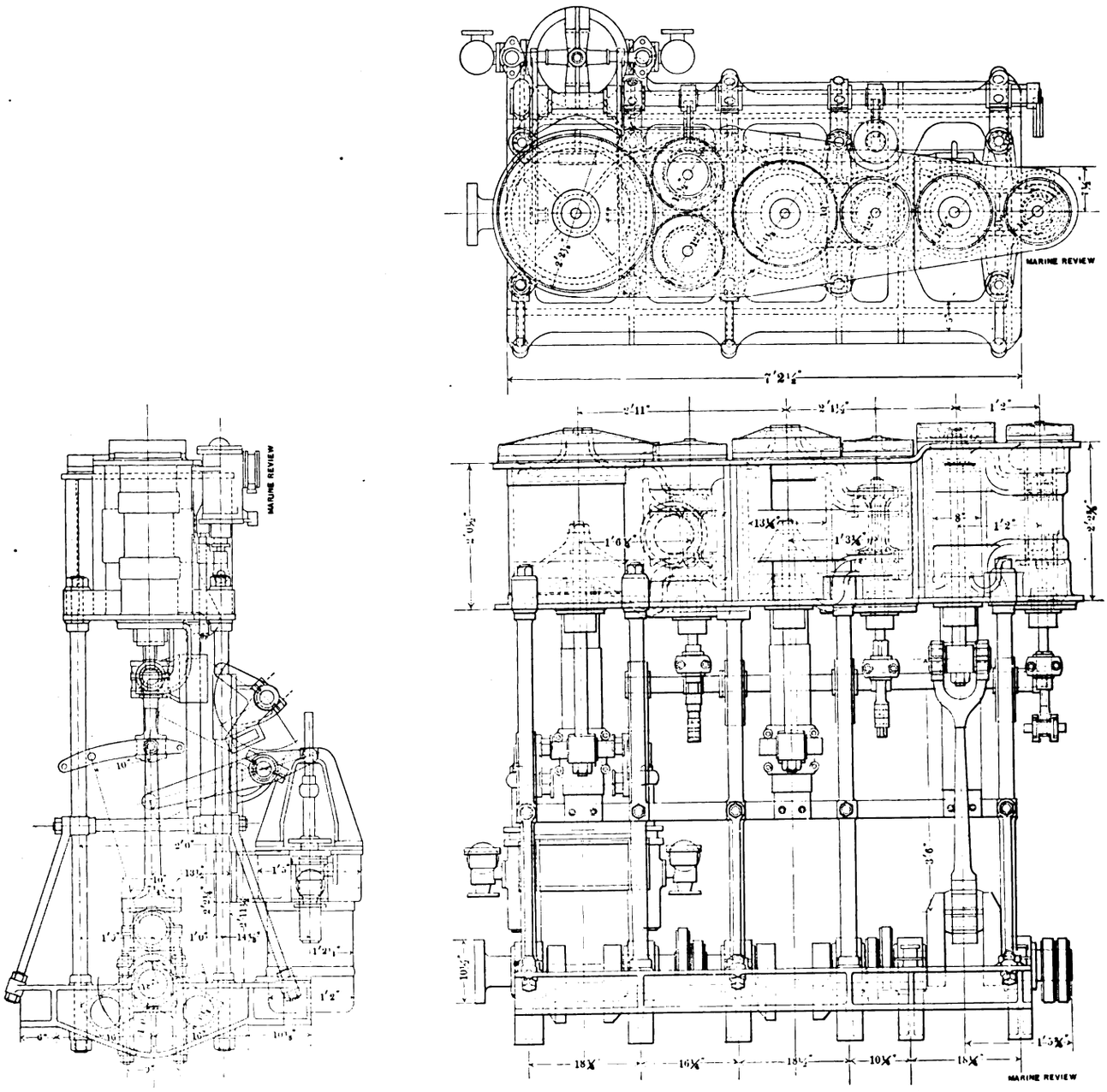
head working on a bar guide. The framing of the engines is of the open type, each engine having ten finished wrought-steel columns, with tie rods. The engine bedplates are of cast-iron, supported on foundations built up from the frames of the vessel. The crank, line, and propeller shafts are forged of steel, and are solid, except the crank pins, which have a two-inch hole bored through them. There is one condenser, of the cylindrical

located in the engine room compartment, and are as follows: One independent circulating pump, of the centrifugal type, for the main condenser, fitted to take water from the sea or the bilges, and delivered through the condenser or outboard.

One independent main feed pump fitted to take water from the filter and feed tanks and discharge to the main feed pipe, and one independent auxiliary feed pump fitted



ARRANGEMENT OF ENGINES OF REVENUE CUTTER NO. 15.

type, placed athwartship in the after part of the engine room. It has 858 seamless drawn composition tubes, ⅝-in. diameter, giving a cooling surface of 840 sq. ft. There is one vertical, single-acting, air pump, 13 in. in diameter, and of 7-in. stroke, attached to each engine, and worked by beams from the low-pressure engine crossheads.

There are two single-acting feed pumps, 1¾ in. diameter and 7-in. stroke attached to the port engine; and two single-acting bilge pumps, 1¾-in. diameter and 7-in stroke, attached to the starboard engine, all worked by arms from the air pump rock shafts. All the pumps are

to take water from the filter and feed tanks, the bilges, the sea, from a suction hose, or the condenser, and discharge into the auxiliary feed pipe, the fire main, overboard, to the salt water side of condenser, or to the feed tanks. Two injectors to feed the boilers are located in the engine room.

One independent bilge pump fitted to take water from the bilges or the sea, and to discharge overboard or into the flushing system. One air compressing pump to maintain a pressure in the pressure tank for the water used in the various staterooms and lavatories. One evaporator

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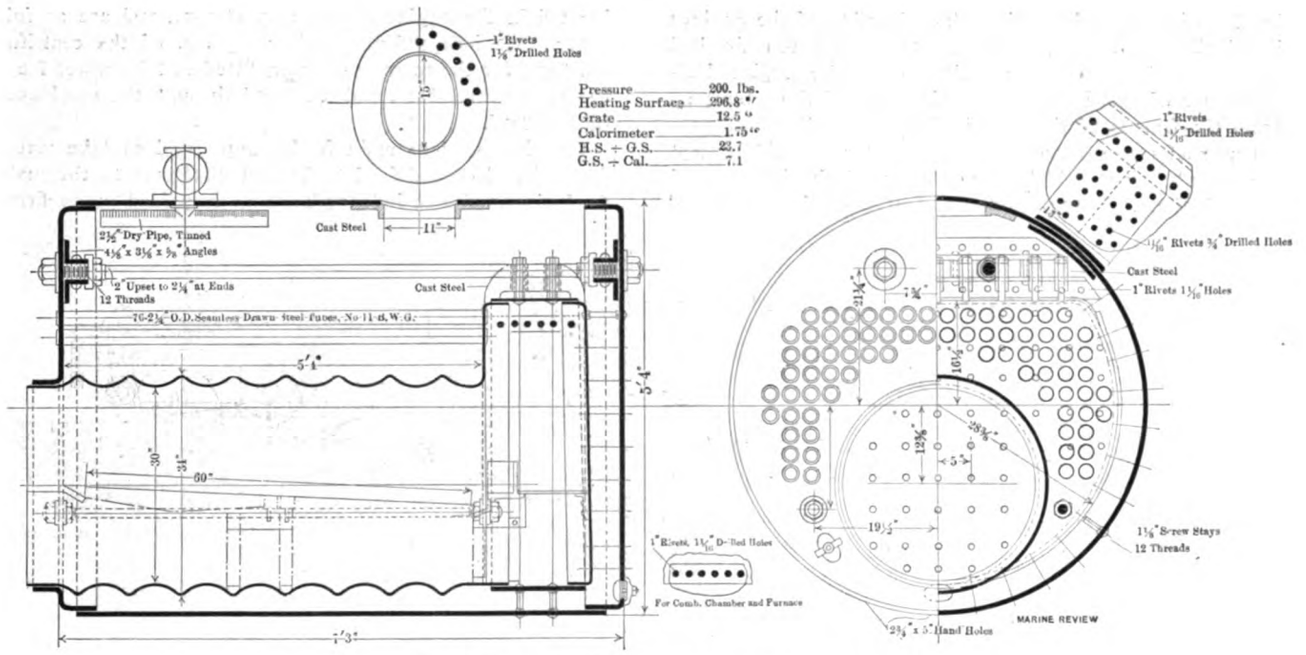

FURNACES AND BOILERS OF REVENUE CUTTER NO. 15.

feed pump, and one distiller circulating pump, fitted to take water from the sea and discharge through the distiller, into the fire main, or the flushing system. A steam steering engine is located in the after part of the upper engine room, where it will be readily accessible at all times.

There is one water tube boiler, about 9 ft. 3 in. long, 11 ft. 9 in. wide, and 11 ft. high measured over the casing. This boiler has a total grate surface of 75 sq. ft., a heating surface of 3,105 sq. ft., and is designed for steam pressure of 200 lb. per sq. in.

There is one single-ended auxiliary or donkey boiler of the horizontal return fire-tube Scotch type, designed for steam pressure of 200 lb. per sq. in. The shell is 5 ft. 4 in. diameter, and 7 ft. 3 in. long, with one corrugated suspension furnace, 30 in. diameter, and 5 ft. 10 in. long. This gives a grate area of 12.5 sq. ft., and a heating surface of 296 sq. ft. The pipe connections between the main boiler and the auxiliary boiler are so arranged that the auxiliary boiler can be cut into line with the main boiler, and used for steaming purposes, if so desired. There is one smoke pipe for these two boilers, 4 ft. 3 in. in diameter, and 48 ft. high.

There is one evaporating and distilling plant, located in the lower engine room, having a capacity of 1,700 gallons of potable water per twenty-four hours. This evaporator is also piped so as to be used for a feed make-up if so desired. The vessel is lighted throughout by electricity, the current being furnished by one steam turbine driven generating set of 20 K. W. capacity, with 125-volt pressure at the terminals. The wiring is of two-wire feeder system, run in steel enameled conduits in the engine and fire room compartments and in approved molding in all other parts of the vessel. There are two 5-ampere enclosed arc lamps in the engine room and fire room, and 120 incandescent lamps throughout the vessel. There is one night signaling apparatus or telephotos, the lanterns being suspended from an outrigger on the mast, and the combinations being controlled by a keyboard on the bridge. An 18-in. searchlight or projector is located on the forward part of the bridge. A complete outfit of hand portable lights, cargo clusters, and 1-12-H. P. fans, is also installed.

There is one steam turbine driven blower or fan installed in the upper fire room for forced draft, the air being supplied to the ash pits of the main boiler. This fan is also connected by ducts to the various compartments of the vessel, being arranged so as to ventilate these compartments either by forcing air to them, or exhausting air therefrom.

Name of vessel	U. S. Revenue Cutter, No. 15
Total I. H. P. and displacement	600 = I. H. P. Disp. = ——
Type and number of engines	Triple Exp. Dir.-Acting, 2 engines
Diam. of cylinders and stroke	8" and 13½" and 22" x 18"
Valve gear	Stephenson link
Connecting rod	42" between centers

	SCALE OF VALVE CIRCLES—DOUBLE SIZE					
	H. P.		I. P.		L. P.	
Eccentricity	1⅝"		1⅝"		1⅝"	
Travel of valve	3¼"		3¼"		3¼"	
Kind and No. of valves	1 Piston		1 Piston		2 Pistons	
Side of valve on which steam is taken	Outside		Outside		Outside	
	Top	Bot.	Top	Bot.	Top	Bot.
Diameter of valves	4¼"		6¾"		7¼"	
Steam lap	¾"	⅝"	¾"	⅝"	¾"	⅝"
Exhaust lap	-3-32"	+⅛"	-1-16"	+5-32"	+1-16"	+¼"
Angular advance	32° 20'		35° 20'		36° 25'	
Steam lead { Angular	9°	12°-30'	9°	12°-30'	7°-45'	13°-45'
Steam lead { Linear	3-16"	5-16"	3-16"	5-16"	7-32"	11-32"
Cut off in inches	13 15-16"	-13⅛"	-13 15-16"	-13⅛"	-13¾"	12 15-16" -
Cut off in Dec. of stroke	.773	.729	.773	.729	.764	.718
Exhaust release in inches	16 7-16"	-16 7-16"	+16½"	+16 9-16"	+16¾"	+16¾" +
Ex release in Dec of stroke	.912	.915	.917	.922	.931	.931
Comp. in inches	1⅝"	+1⅝" +	1¾"	-1¾"	+2 3-16"	-2⅜" -
Comp. in Dec. of stroke	.091	.092	.097	.098	.121	.131
Steam opening	⅞"	1"	⅞"	1"	⅞"	1"
Exhaust opening	Full	Full	Full	Full	Full	Full
Velocity of steam in ft. per sec. at { 660 ft. per min.	59.4	51.7	102.1	89	131	114
sec. at { 220 revs. per min						
Velocity of exhaust in ft. per sec. at { 660 ft. per min	46		79		102	
sec. at { 220 revs. per min.						
Velocity of exhaust to condenser			95			

Displacement in salt water to -5'-0" water line	408 tons
Total coal capacity	47 tons
Normal coal supply	25 tons
Total fresh water	8,200 gals.
Normal fresh water supply	2,400 gals.
Area of midship section to the 5'-0"-water line	143.54 sq. feet
Area of immersed longitudinal section to the -5'-0"-W. L.	693.46 sq. feet
Area of the 5'-0" water plane	3,345 sq. feet
Wetted surface to the 5' 0" water line	4,366 sq. feet
Tons per inch of immersion -5'-0" W. L.	7.96 tons
Coefficient of midship section	0.937
Coefficient of the 5'-0" L. W. L	0.735
Coefficient of displacement	0.644
Frame spaced	24 in.
Section spaced	10 feet
Water line spaced	12 in.

The Martin Dredging & Wrecking Co., Escanaba, Mich., has purchased the tug Kate Williams, of Manitowoc, and will station it at Escanaba.

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A SUCTION GAS PLANT BOAT.

One of the largest examples of the application of suction gas engines to the propulsion of boats for river navigation is furnished by the river boat Lotte, a barge with a flat wooden bottom 139½ ft. long and 15 ft. beam, carrying 240 tons upon a draught of 6½ ft. This was originally intended for service on the Elbe, but has been retained by the builders of the engines, the Otto Gas Engine Company, of Deutz, for their own carrying trade between Cologne, Antwerp, and Rotterdam. In order to obtain good balance for the engines, a four-cylinder horizontal arrangement has been adopted. The engine develops a total of 80 to 100 horsepower, which is sufficient to drive the boat about 3½ miles an hour against the current in the river. A sectional elevation of the engine as shown in Fig. 1 needs no explanation. The valve mechanism is clearly shown in another illustration, Fig. 2. The screw shaft is connected with the engines by a friction coupling. The gas producer is placed in front of the engine room, from which it is separated by a bulkhead with sliding doors, which can be closed during the operation of cleaning the grate from ash and clinker. The screw is 4 ft. 3 in. diameter, and is fitted with four blades reversible in direction by a rack and pinion motion; the reversing rod ends in a series of toothed racks which gear into corresponding pinions on the axes of the reversible propeller blades. The power required for reversing is taken from the main engine shaft by a combination including a friction coupling, differential gear wheels, and toothed clutches and helical gears, which screw the rod backward and forwards, as shown in the sketch, Fig. 3. This is brought into action by throwing the clutch into the back or forward gear as required when starting it by the frictional coupling with the main engine. The motion necessary for any required pitch is marked on a divided scale, and this is varied according to the action

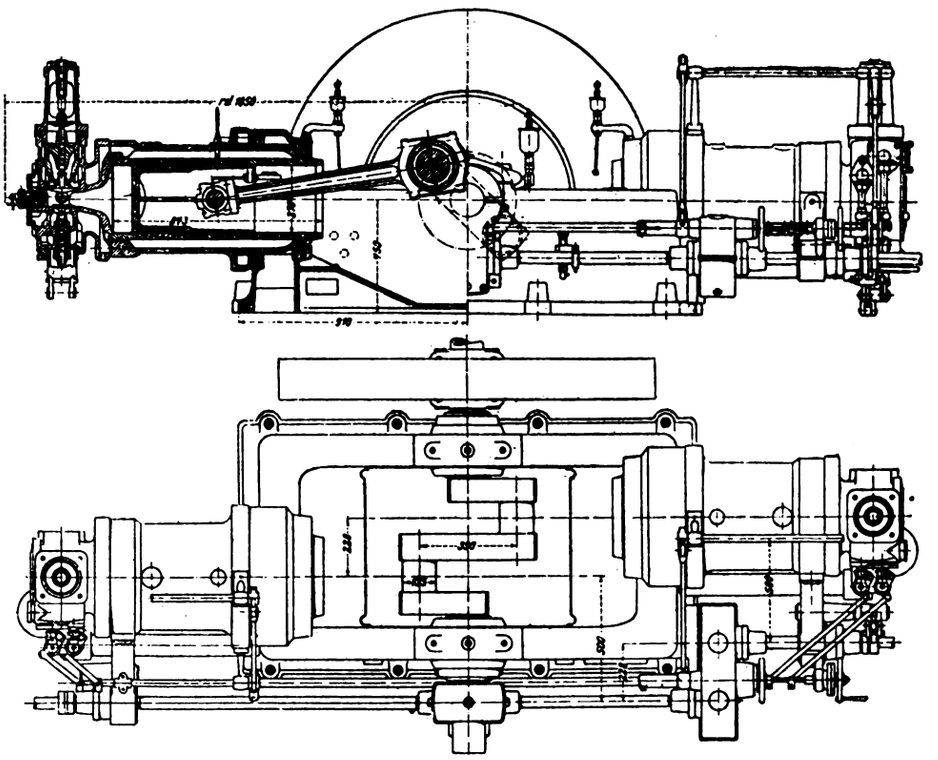

Fig. 1—MARINE GAS ENGINE

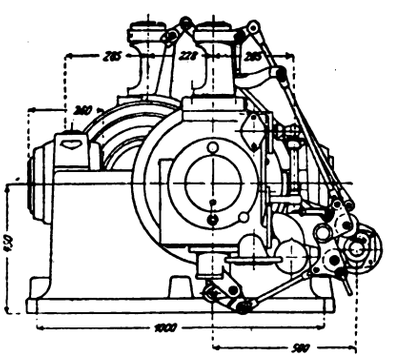

Fig.—2 END VIEW OF ENGINE

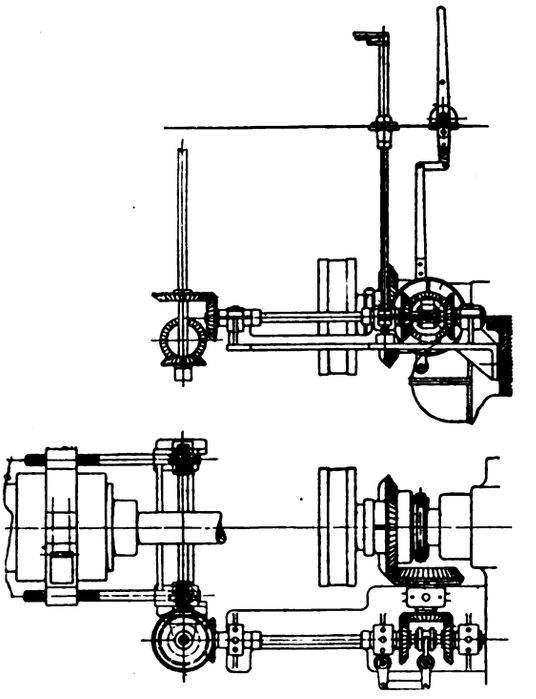

Fig. 3—STARTING AND REVERSING GEAR

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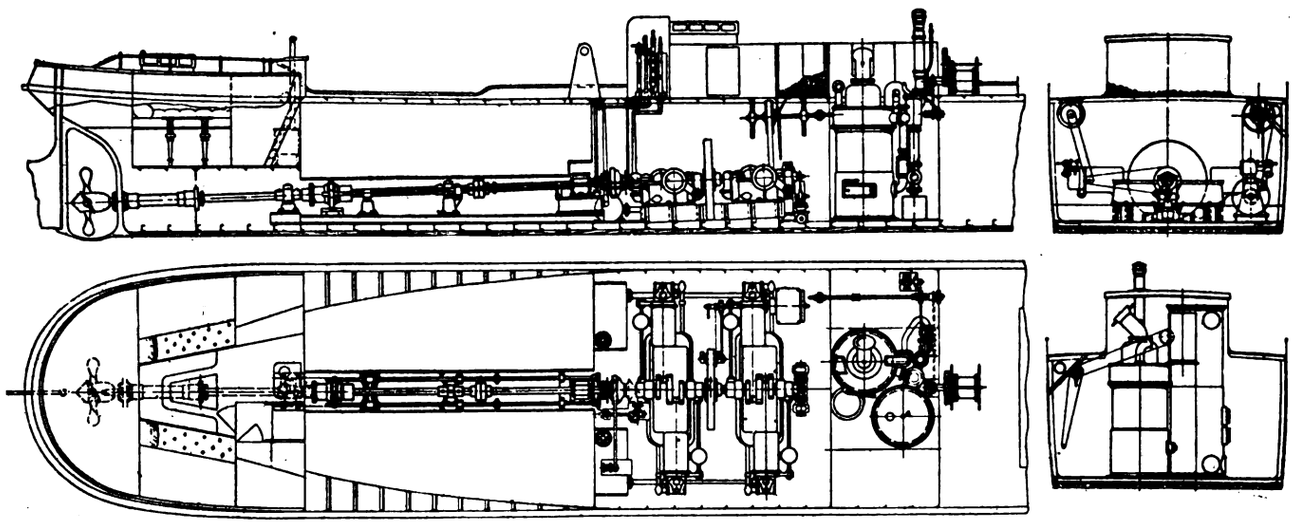

RIVER BOAT WITH SUCTION GAS ENGINES.

of the engine, the pitch being gradually increased until the full load is attained.

For starting as well as for working the fan blower on the cargo winch on deck, a small benzine engine of 6 horsepower is provided, which starts the main engine by a frictional connection with the fly-wheel and keeps it running until ignition in the cylinder has commenced. When the engines have been standing for a long time the fan blower is used for a few minutes to enliven the combustion in the producer. This, as well as the deck winch, is driven by a belt and a line of overhead shafting.

Up to the present time eleven different boats with suction gas plants have been built by the Deutz Company, the horizontal arrangement being used for the larger sizes, with two cylinders up to 45 and four for 65 to 90 horsepower, the latter running at 275-325 revolutions per minute. For smaller boats the ordinary vertical marine type of engine is used, with two, three, or four cylinders, mineral oil or alcohol being used as fuel. Boats of smaller power are largely used in Holland, and it is said that 280 of these, together developing 2,500 horsepower, have been supplied to that country by this firm, out of a total of 320, with 4,000 horsepower of engines.

Cargo boats of the kind described above have been found to be extremely economical in working, the following results having been attained in the Rhine navigation between Cologne and Rotterdam—a distance of about 190 miles. With a boat of 250 tons carrying capacity, with an average load of 200 tons and engines of 100 horsepower, costing about £2,250, the average time required for the round trip, inclusive of all stoppages, is fourteen days, thus giving twenty-six voyages in the year.

	£	s.	d.
Depreciation on hull, 5 per cent on £1,000....	50	0	0
Depreciation on engines, 10 per cent on £1,250....	125	0	0
Interest on capital, 5 per cent on £2,250.....	112	10	0
Insurance, 4s per cent on £2,250.....	2	5	0
Navigation dues, 26 trips at £7 10s.....	195	0	0
Fuel (anthracite at 20s per ton), burnt at the rate of 1.32 lbs. per horsepower hour for 75 hours per round trip, 50 hours up-stream and 25 hours down-stream—117 tons.....	117	0	0
Lubricating material and cotton waste.....	48	15	0
Wages	350	0	0
Total annual outlay.....	1,002	10	0

The cargo carried was 200 × 26 = 5,200 tons for a distance of 375 miles, or 1,950,000 ton-miles, corresponding to a cost of 0.1235d, something less than half a farthing per ton-mile. The corresponding cost of carriage by the ordinary river steamboats is about one-half more, on the lowest railway freight about five times as much. On the Saarbrucken Mullhausen canal, where the round trip of 170 miles required 30 days, including 9 days' detention and 9 days' returning light, the cost, with the gas engine in a boat of 240 tons, with a 16-horsepower engine, was only two-thirds of that of horse traction, the boat making eleven journeys in the year by the former as compared with seven by the latter method.

Above we give an illustration of the general arrangement of the machinery of the barge we have just described. The plant is very compact, and takes up little space. Attention should be directed to the small amount of room required for fuel storage. The arrangement of the propeller shaft can also be seen clearly in the illustration. We are indebted for the above particulars to the *Zeitschrift des Vereines Deutscher Ingenieure.*

PERSONALS.

Mr. John M. Mulrooney who has been active in newspaper work during the past twenty years and who founded the MARINE REVIEW in 1890 and continued as its publisher for fourteen years thereafter, has entered the brokerage business in Cleveland with offices in the Rockefeller building. He will have as a partner Mr. James J. Fitzgerald who has been engaged in this business for three years past with Otis & Hough. A seat has been purchased on the Cleveland Stock Exchange and the new firm will deal exclusively in local securities. Mr. Fitzgerald will give his entire time to the exchange work. The new firm will give special attention to vessel stocks and bonds and with Mr. Mulrooney's intimate and extensive knowledge and wide acquaintanceship the firm should prove highly successful.

Mr. Albert Ladd Colby announces that he has opened an office as consulting and inspecting engineer and iron and steel metallurgist at No. 477 Central Park, west, New York.

The highest bid for the purchase of the United States revenue cutter Peter Washington out of commission at the service depot, Arundel Cove, Curtis Bay, was made by John H. Gregory, Perth Amboy, N. J., at $610. The Washington was built at Camden, N. J. in 1864 as the Uno. Later she became the lighthouse tender Juniper and then the Uno again when transferred to the revenue cutter service. She is of the tug boat type and for years was used at Philadelphia as the custom's boarding boat.

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THE MARINE REVIEW

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ENCOURAGING NEWS FROM WASHINGTON.

Encouraging news concerning the status of the shipping bill is daily being received from Washington. President Harvey D. Goulder of the Merchant Marine League has spent the greater part of the last month in Washington, looking after shipping legislation, and was instrumental in interesting President Roosevelt in the success of the measure in a greater degree than ever before. At his solicitation Representative Minor of Michigan, and Representative Humphrey of Washington, also called on the president and secured from him a stronger endorsement of the measure than was even given in his recent message to congress. There is no doubt whatever but that the administration will lend its aid towards the passage of the bill in the house. As known, the bill has already passed the senate, and probably while it is not all that can be desired, it is sufficient for a trial. Whatever faults the measure has are on the side of conservatism. If the United States would only devote to the upbuilding of its merchant marine one-twentieth of the sum it devotes annually to the upkeep of the navy, it would speedily have a merchant marine to be proud of. Every country that has a merchant marine has secured it through favoring legislation. There is no reason why the United States should decline to do what other nations have done or indeed what it has already done for every other American industry. What the American merchant marine needs is assistance. At present a frightful handicap is imposed upon it and one which will, unless removed, crush the remnant of its shipping in the over-sea trade.

ANIMUS OF SHIPPING OPPOSITION.

The New York Merchants' Association has taken a position of hostility to the pending ship subsidy bill, but this was to be expected, as one of its very active and influential vice presidents is the New York agent of the North German Lloyd Steamship Co., which company draws $1,330,000 annual subsidy from the German government. Naturally, the Germans don't want any American competition, if they can avoid it, upon the sea, and their hand may be plainly seen in the attitude of the New York Merchants' Association in which German shipping interests are sure to be safeguarded. Again, the chairman of the committee on ship subsidies and shipping, of the Merchants' Association, is a charterer of foreign steamships that are regularly run between New York port and the ports of the west coast of South America. This gentleman professes (?) to favor subsidies for American shipping, but it seems to be impossible for anyone to frame a subsidy bill that will suit him. He objects to them all.

When the Congressional Merchant Marine Commission had its public hearings in New York we do not recall that the Merchants' Association, now so active in opposition, was at all in evidence in favor of an American merchant marine. That was the time, and there was the place, for this association, if sincerely friendly to American shipping, to show itself to be so. But it did not. It preferred to await in silence the preparation of the commission's bill, and then find finical fault with it, the sincerity of its criticisms being very greatly doubted by those who are familiar with the peculiar methods of its committee on ship subsidies and shipping. Another suspicious circumstance is the fact that its long-winded letters find ready and conspicuous space in newspapers most pronounced in their opposition to subsidies for American shipping. When the New York assembly had before it a resolution in favor of the shipping bill, the New York Merchants' Association's committee on ship subsidies and shipping addressed every member a long letter alleging reasons for its opposition, the result being that the resolution was adopted by the assembly by the decisive vote of 95 for to 16 against. If the opposition of the Merchants' Association before the house of representatives is no more hurtful to the shipping bill than it was before the New York assembly, we can forgive it.

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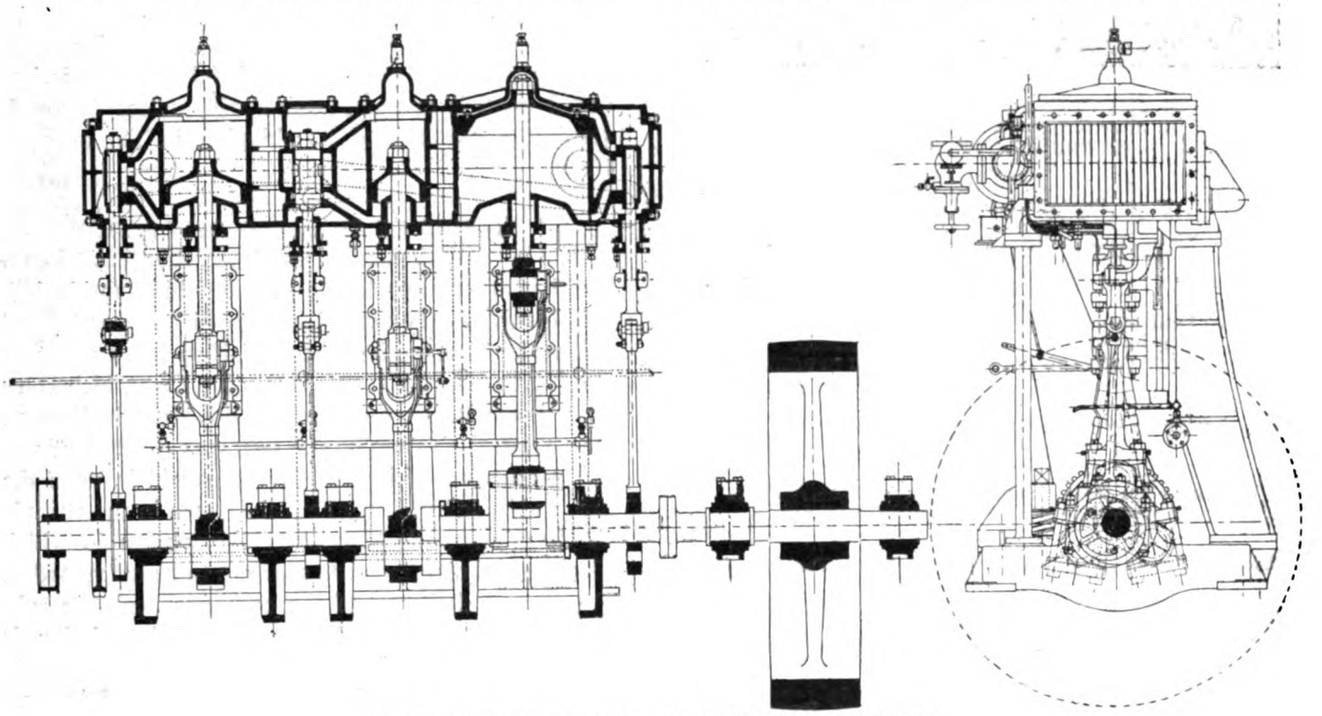
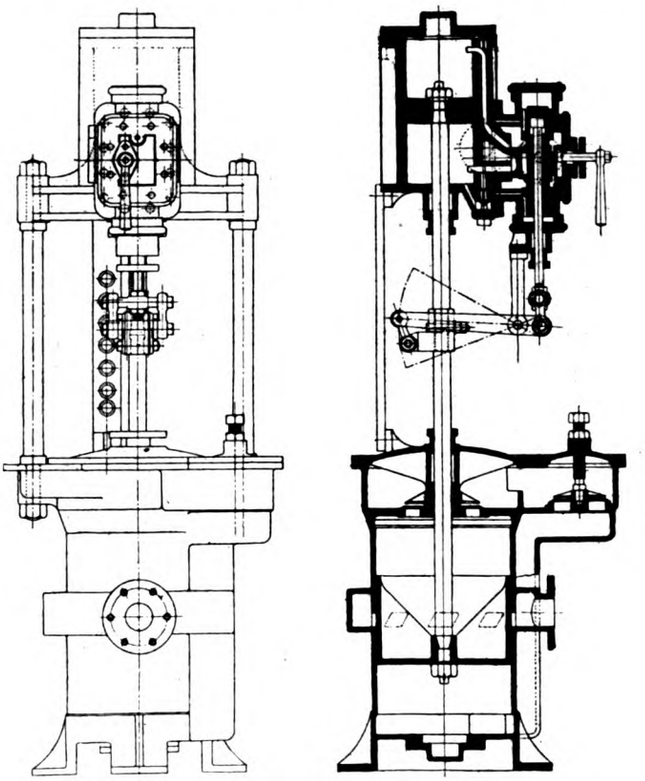
MACHINERY AT THE NEW ROYAL NAVAL COLLEGE, DARTMOUTH.

A short time ago the new Naval College at Dartmouth, for the training of junior naval officers under the new system, was opened. As necessary to this system a large and valuable collection of tools and plant has been laid down in the workshops for the teaching of practical engineering. In addition to this, and for the purpose of instructing the young officers in the practical working of the steam engine, a triple-expansion engine, with independent surface condenser, air and circulating pumps, and all necessary tanks, pipes, etc., for measuring the water consumption under different circumstances, has been installed in the engine-house. The triple-expansion engine, is of the ordinary vertical marine type, without reversing gear. The cylinders are carried by four turned and polished steel columns in front, and three cast iron columns of strong section at the back. They are 9½ in., 14½ in., and 23 in. in diameter respectively, with a stroke of 15 in., the high-pressure cylinder being fitted with piston slide valve, and arranged between the intermediate and low-pressure cylinders. This arrangement has been adopted in order to give easy access to the intermediate and low pressure slide valves, as the engine will be used for the instruction of the cadets. The engine was required to develop 120 H. P. when running at about 120 revolutions per minute, with steam having a boiler pressure 140 lbs. per square inch; but, in order to have ample margin of strength, the machinery was designed for a working pressure of 185 lbs. per square inch. The scantlings, bearing surfaces, etc., are, therefore, larger than are actually required, a point of considerable advantage when it is remembered that this engine will be looked after by the young officers, and that it will be opened out, overhauled, adjusted, etc., etc., by them as part of their training. The pistons are of stamped steel of the coned type, machined all over, the high-pressure and intermediate-pressure pistons being fitted with hard gun-metal Ramsbottom packing rings, and the low-pressure piston with ordinary double cast iron spring rings. The piston-rods are of forged steel, solid with the crosshead, the slippers being of gun-metal lined with white metal, in conformity with the usual admiralty practice for high-speed engines. The crank shaft is of steel, in one solid forging, the bed-plate being of cast iron of strong section. Metallic packing of the "combination" type is fitted to the piston-rods and slide-rod glands. To ensure steadiness of running a large, heavy cast iron fly-wheel 5 ft. 6 in. in diameter and 16 in. wide on the face, carried by a separate shaft supported by two plummer blocks, and coupled direct to the crank shaft, has been provided. The face of this fly-wheel is utilized to drive a dynamo by means of a belt 12 in. wide.



MARINE ENGINE AT THE ROYAL NAVAL COLLEGE, DARTMOUTH.



INDEPENDENT VERTICAL AIR PUMP

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The governor is of the Peach type, all working parts running in a bath of oil in a case.

The steam from the main engine, as well as from the auxiliary engines used in connection with it, is condensed in a large independent surface condenser, having 435 sq. ft. of cooling surface, the condenser being made in accordance with the latest admiralty practice, and provided with the usual admiralty fittings. An independent vertical air pump of the "Simplex" type, with steam cylinder 6 in. in diameter, pump 12 in. in diameter, and stroke 9 in., is fitted, to work in conjunction with the condenser. We are informed that this pump worked in a satisfactory manner throughout the series of trials, and maintained a high vacuum. A drawing of it appears herewith. From this it will be seen that the steam cylinder is of the ordinary three-ported type, with a flat valve face, on which works an ordinary slide valve of the usual D class. This has been adopted in preference to the cylindrical slide valve so frequently used, as it can be refaced many times before needing replacement, and this can be done by any engine fitter without special knowledge. The slide valve engages with, and is arranged to be operated by, a shuttle valve of the usual type working in small cylinders at each end of the valve chest. The shuttle valve, and by its means the slide valve, is operated positively through the medium of the valve spindle, worked by the levers attached to the piston-rod crosshead. At each end of the shuttle valve are small ports, so arranged that at a certain period of its travel these are brought opposite to corresponding ports in the valve chest, the effect being that one end of the valve is put in communication with the steam from the boiler and the opposite end is opened to exhaust. This causes the shuttle valve, and with it the slide valve, to complete the remainder of its travel by means of the steam pressure at one end, independently of the valve spindle, there being sufficient slack or play left to permit of this. As the slide valve completes its travel independently of the valve spindle, it has not to work the latter through its stuffing-box, and hence no tightening of the gland affects it. Instead of the shuttle valve being directly attached to the main slide, it operates the latter by means of a forked sleeve-piece, which can be put on or withdrawn by removing the valve chest cover. When this is taken off, the shuttle and slide valves are entirely disconnected from one another, the shuttle valve can be taken out through the end of the valve chest, and the slide valve through the slide. Thus, by means of this sleeve-piece, the whole of the valve gear can be taken out and replaced without breaking the joint between the valve chest and steam cylinder, and without disconnecting any pipes. For circulating the water through the condenser, a centrifugal circulating pump driven by its own steam engine is fitted, the engine cylinder being 4 in. in diameter by 3 in. stroke, and as at low tides the lift is too high for this circulating pump, a direct double-acting reciprocating pump is also supplied. This pump is of the "Duplex" type fitted with Mumford and Anthony's patented valveless steam cylinders, the diameter of the cylinders being 8 in., pump barrels 8 in., and stroke 8 in.

Arrangements are made for measuring the steam consumption of the main engine, as well as that of the auxiliary engines, and also of a Parsons' steam turbine which has been fitted for instructional purposes, and the exhaust of which leads into the condenser of the main engine above described by means of the usual measuring tanks. The order for the whole of the above installation was placed with A. G. Mumford, Limited, Colchester, and the contract time allowed for delivery of the above installation, including fixing and erection at Dartmouth, supplying and fixing all the necessary piping, etc., for connecting up to the boilers, turbine, etc., was five and a half months.

SMART PIECE OF REPAIR WORK.

An exceptionally smart piece of repair work was recently accomplished at Sunderland. The steamer Gresham of 6,000 tons arrived with a breakdown in her engine room, which necessitated the removal of the whole of her engines and bedplates. The vessel arrived on Thursday, Dec. 21 and the work of lifting out the machinery was commenced on the Saturday morning following, and by noon it was all on the quay, and the work of fitting the new portion was begun. The job was resumed on Sunday midnight and by Tuesday morning the repairs were completed and the engines were erected in the shop. They were afterwards taken down and at noon of that day the bedplate was lowered into the ship and secured, and by 5 p. m. the engines were all in position. By 9 the following morning (Wednesday) the engines were tried under steam and the ship declared ready for sea, the steamer moving the next day for coaling purposes and sailing on Friday for an American port. The total time occupied by the engineers (Messrs. John Dickinson & Sons and Messrs. J. L. Thompson & Sons) in lifting out the machinery, fitting the new portion, erecting in shop, dismantling, replacing on board and coupling up from the time the repairs were commenced until the vessel was under steam, was only 73 hours, without allowing for meal hours,—a most creditable performance.

FLOATING DRY DOCK AT NEW ORLEANS.

The port of New Orleans is now equipped with a capacious floating dry dock for merchant work. With the exception of the government dock at Algiers which could take only one merchant job occasionally, there is no adequate facility at New Orleans for the repair of vessels. Messrs. Woodward, Wight & Co., Ltd., Mr. Norris Stern and Mr. George A. Hero, started a year ago to remedy this deficiency by the construction of a dock capable of lifting 5,000 tons deadweight and able to take in ships 375 ft. long. The dock was built at Orange, Texas, under the personal supervision of Walter Thompson, one of the most capable dock men in the United States. The new dock has been handled at Algiers. It is the purpose of the New Orleans Dry Dock & Ship Building Co., the owners, to build a smaller dock of 1,200 tons capacity and also to establish launching ways.

STEEL BARGES FOR RIVER TRAFFIC.

The American Bridge Co. has closed a contract with the American Steel & Wire Co. for the construction of ten steel barges for use in Pittsburg harbor and in hauling coal from the mines along the Monongahela river to the company's plants at Rankin and Shoenberger Mills. This order is very gratifying inasmuch as it proves conclusively that the ten barges built for this company last year have been satisfactory. The American Bridge Co. is now building at Ambridge the ten barges for the American Steel & Wire Co., two rectangular hulls, 30 by 130 ft., for five yard dipper dredges to be used on Panama canal work and a steamboat hull for James Rees & Sons, who have the contract to build a Mississippi river packet. The Panama hulls will be built at Ambridge plant, together with the Ohio river boats and after being fitted will be taken apart and shipped in "broken down" shape to the isthmus. Last year the Ambridge plant of the bridge company turned out seventeen hulls, ten of which were coal boats for the American Steel & Wire Co.

It is announced that the final plans and specifications for the new Detroit & Cleveland Navigation Co.'s steamer will be submitted to the lake ship builders early in March.

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FROM PUGET SOUND TO THE ORIENT.—AN ENGINEER'S EXPERIENCES.

(From *The American Machinist.*)

Several years ago I was third engineer of a tramp steamer of about 4,500 tons, with triple-expansion engines of 2,000 indicated horsepower. The condenser, air pump and circulating pumps were at the back of the engines, operated by working levers from the low-pressure crosshead. We were chartered to take a cargo of flour and timber from Tacoma to Vladivostok, Port Arthur and Dalny. After three weeks' steaming at a steady 10-knot gait, we arrived at Mororan, in the island of Yesso, close to the Hakodate naval station, Japan. After refilling our bunkers there, we went north to Vladivostok, where we discharged part of our cargo and proceeded to Dalny. The captain was dubious about entering the latter port, as the place was not properly charted, and the pilots there were somewhat of the same type as the old Scotch fisherman who was engaged to pilot a yacht among the Scottish western isles. When asked by the owner if he knew all the rocks in the vicinity, he answered, "Ay, ah ken them a' "—"an' that's one o' them," as the yacht shuddered and lurched to one side. After we had entered the harbor, and the skipper had selected what he thought would be a good anchorage, he backed the engines while lowering the cable, and in doing this the ship ran across some rocks and damaged fourteen plates in the double bottom, so that she commenced to leak badly. We kept the pumps working in the leaky section, got logs, sacks and several tons of cement from the shore, with which we filled up the double bottom solid in the vicinity of the damage and made the ship nearly water-tight thereby. After discharging our cargo at Dalny, we proceeded to Port Arthur, and while lying in the harbor there we discovered that one of our four propeller blades was broken short off close to the hub; so we determined to replace it with a spare one, which we had in one of the holds.

We rigged up a raft and tried to "tip" the ship up at the stern by filling the forward tanks and pumping out the after ones; but in this we were unsuccessful; so we flooded the forward hold, and even this only raised the hub of the propeller three inches above the water; this was, however, high enough for our purpose. At 6 a. m. next day we started in to remove the nuts from the studs securing the base of the broken blade to the hub. One of the studs was broken, but we managed to get it out of the hub with the aid of a calking tool and heavy reamer. It was no pleasant task, as the temperature was below zero and the water washed continually over the raft. I might mention that the big ice-breaker was at work in Vladivostok harbor at the time, but we had the new blade in place, nuts tightened and all cemented over at 4 p. m. the same day.

Quick work! but we had to work hard to keep warm, though the warmth was partly produced by the contents of a gallon jar which the skipper brought aboard for us. We left Port Arthur next morning for Mororan to load coal for Singapore. We had lain in Mororan about fourteen days, and taken advantage of the time at anchor to thoroughly overhaul the engines and boilers. Just when we had the machinery all apart, a storm rose and the sea became very rough, causing the ship, which was very light and thereby exposing a great surface to the wind, to strain heavily at her anchors. While we were in this condition a Japanese bark came in and anchored between our ship and the shore and right in our path if the ship should drag her anchors. There was every chance of this occurring, as we were anchored on a sand bottom. Our captain signalled to the Japs to shift their anchorage, but they did not take any notice of our signals. About 10 p. m. we began to drift down on them. The Japs now saw their danger, and began with frantic haste to pay out their cables until they were all out and they could do nothing further to save their ship. Shortly afterward the two ships came together and carried away the Japs' foremast and yards and our topmast. The Japs all scrambled on board our ship and would not go back; so our chief engineer and second mate jumped on board the bark with the intention of securing her to our ship with ropes, so as to prevent further damage; but they failed in this, as the ship yawed apart almost immediately. In the meantime we were letting out our cable as rapidly as possible, so as to get astern and clear of the bark. In this we were successful, but the next plunge the bark took she went right over our cables, and whenever our ship dragged on them the bark was almost lifted out of the water. Finally we got clear of each other, and our cables held when we were only about 200 yards off the beach.

Next morning the storm abated, sampans came off and took the Japs back to the bark and returned with our two officers, who were cold and hungry, as the only sustenance they could find on the bark was a bottle of "samshu" (native whiskey), which they confiscated, consumed and felt comforted thereby. In the afternoon a police boat came off to us and took the skipper ashore to the court to show why he should not pay a claim of several thousand yen to the owners of the bark as a result of the previous night's damage. The captain consulted the steamship's agents and the consul, and was privately advised by both to get to sea as soon and as quietly as possible.

We got the remainder of the coal on board while the engineers were "closing up" the engines and boilers and raising steam. One dark but clear morning we heaved anchor, and with no whistle blowing nor pilot on board, we slipped through the straits past the Japanese naval station and laid our course for the open sea. Early in the forenoon the vacuum fell several inches, and a rattling sound in the circulating pump warned us that something was wrong in that direction. We were very chary of stopping, but decided that to be the best course of procedure, "lest worst befall us." We took the doors off the circulating pump and found that two valve seats had carried away. These were circular brass gratings, screwed into the gray-iron frame of the pump. The threaded part of the frame had corroded away and allowed the seats to get loose. We decided to make a couple of clamps to hold them, and as there was no material in the engine-room, we took one of the bars from the hatches—which are used for securing the canvas covers to them—and cut off four pieces, each about 1 inch longer than the diameter of the seats. We then punched two holes, ⅜ inch in diameter, through each of them, and cut four pieces of ½-inch pipe, 1½ inches long, which we placed between the bars and over the holes, and passed ⅜-inch bolts through them, the whole forming two clamps, one of which we placed under each seat. Then we removed the deep lock nuts from the lower end of the studs, which passed through the center of each seat and valve, and to which the valve guards were secured. We reduced the deep lock nuts on these studs one-half in thickness. The clamps were placed under the seats, and the center studs projected through them. We screwed the reduced nuts under the clamps and riveted the ends of the studs over them. We boxed up the pump and got the engines under way again after a stoppage of about one and one-half hours.

Shortly afterward, when we were several miles from the coast, a cloud of smoke appeared on the horizon behind us, and the tiny dot from which it arose speedily resolved

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itself into a torpedo destroyer coming full speed toward us in a smother of foam. We all felt pretty sick, and had visions of durance vile in a Japanese prison, with rice as a staple diet, as the laws which we had infringed were many; but to our surprise the destroyer merely steamed up slowly alongside, and after scanning the ship closely she crossed our bows and headed back for Hakodate, her mission evidently having been to identify us. We naturally expected to have further visitants with the "Rising Sun" flag floating over them, and the ease with which we

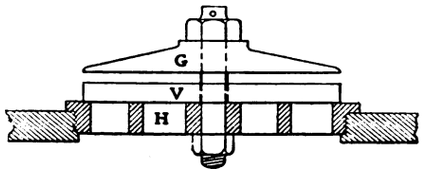

FIG. 1

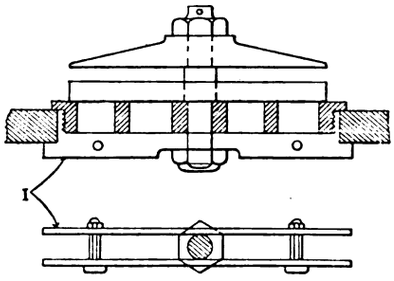

FIG. 2

SHOWING THE REPAIRS MADE.

had been overtaken convinced us that we had no chance of escape if they desired to detain us; but we saw nothing further of them, and eighteen days later we arrived at Singapore, with the northwest monsoons driving behind us, and there we went into the graving dock, where we had the bottom patched up for our long run to the Pacific coast.

Fig. 1 shows one of the valves of the circulating pump, V being the valve, G the guard, H the grating. Fig. 2 shows the repair made, I being the clamp. H. J. T

MODERN NAVIGATION.

When Mr. Harry Coulby, president and general manager of the Pittsburg Steamship Co., established free schools under the supervision of Capt. J. M. Fields in a number of cities for the masters of his vessels whereby they might obtain instruction in practical navigation and compass adjustment, he set a great many vessel owners, and also a great many masters, thinking. Probably at no time on the great lakes has the subject of scientific navigation occupied so much attention. The modern lake steamer costs a great deal of money, some of them approximating $500,000, and consequently anything that makes for the safety of the ship has become of much importance. Lake masters are becoming navigators in the real sense of the word and it will become increasingly true as the years go by. For that reason any work which tends to simplify the problems now confronting the masters of vessels is to be welcomed. One of the best works on the subject of navigation is a book entitled Taylor's Modern Navigation, published by Capt. Henry Taylor, of San Francisco, and sold by the MARINE REVIEW. In his work Capt. Taylor begins at the beginning. The work is so comprised as to be a complete text book for the beginner and a source of much profit to a well seasoned navigator as well. The aim of the author has been to write a work on navigation that should so simplify all the problems involved in the art that, no matter how limited his education, the student, if he is only able to read and write, may attain a high degree of efficiency as a navigator. The simplicity of the work is at once apparent. The four first divisions of arithmetic are first considered, and thus by easy stages the student is led up to the more difficult problems, and all is explained in the simplest language. Every problem is fully illustrated, and numerous examples are given for practice. There is an almost entire absence of algebraical signs, so confusing to the ordinary beginner. As a work of reference, the arrangement is such that any subject treated, or any problem worked, may be readily found. This feature will be appreciated by those that may have become "rusty." For the use of the modern navigator, methods are given whereby may be obtained the position of the ship, at any time of the day or night, by single and double altitudes of the sun, stars, and planets. For finding the deviation of the compass, instances are given that will be found applicable to any case, no matter what the class of the vessel may be. In this connection a description is given of the different kinds of the pelorus on the market, and of the other instruments used in the taking of bearings and azimuths, with rules for their use. The subjects of chart work and coast navigation have been exhaustively treated, and many matters related thereto, with which seamen are not generally familiar, have been introduced, such as the proper application and use of deviation when taking bearings and finding the course to steer. Tides, and the time of their occurrence, with reductions to soundings (very useful in finding the depth of water when crossing a shallow bar), are considered in a separate division. The difficult subject of compass adjustment is treated in an entirely original manner, all problems being worked by the four simple rules of arithmetic. A valuable feature of this division of the work is the diagrams in colors. Very little study of this division on the part of the navigator will enable him to compensate his vessel's compasses himself.

The entire work is written with the special object in view of encouraging the American seamen to take advantage of the numerous publications of the United States Hydrographic Office—publications which may be procured for less than their cost to the government and of the very existence of which so many seamen are entirely ignorant. Since the first announcement of the publication of the work, the author has been encouraged by the demand for copies from the Atlantic coast, from the great lakes, as well as from the entire length of the Pacific coast, assuring him of the correctness of his judgment in its publication. The price of this work is $6.

Capt. Edward J. Starkey, Ashtabula, O., has just published a very useful little book known as Starkey's Pilot's Guide and Ready Reference for use on the great lakes. Briefly, the book comprises the courses, distances, ranges, shoals and bearings, lights and fog whistles on Lake Erie, Detroit river, Lake St. Clair, St. Clair river, Lake Huron, Straits of Mackinaw, Lake Michigan, Green Bay, Sault Ste. Marie river, White Fish Bay and Lake Superior. It also gives the lead line direction for passing buoys, signals for the United States mail boat at Detroit, weather bureau wind signals, variation, deviation, local attraction and fore point bearings. It is an extremely useful compilation for young men on lake vessels and it is reasonably sure that it will be greatly appreciated by them. Mr. Starkey has received a number of endorsements of the work from vessel owners. The price of the book is $1.50. It is for sale by the MARINE REVIEW.

Antonio C. Pessano, president and general manager of the Great Lakes Engineering Works, Detroit, announces that the steamer Lycoming which the company took over from the Anchor line, has been sold to Capt. James O'Connor, of Tonawanda, N. Y. She will be converted into a single deck lumber carrier.

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A NEW TYPE OF MARINE FIRE-TUBE BOILER.

The Engineer of London has published the following article and drawings from Colonel G. Scialpi, of the Italian royal navy (naval architects' branch), at present stationed at Leghorn:

It is well known how the fire tube boiler, both in its Scotch and locomotive shape, fell out of favor when it proved unsuitable to the increased needs of modern warships. These needs required an increase in the power of machinery, and with this object forced draft was tried with disastrous results.

The marine fire tube boiler has since its appearance been characterized by a defective design and performance, which refer chiefly to the circulation, to the short run of gases, and, as to the Scotch type, to the size of furnace. Notwithstanding these defects, which are, however, very important from a tactical or economical point of view, the fire tube boiler lasted for years, and the necessity of its substitution was only felt when it could no longer answer the new exigencies. The water tube boiler, which took the place of the fire tube boiler, on the other hand, was not new as to the principle of its construction. Why, we might ask, was it not found natural to shorten the way to the introduction of the water tube boiler, so advantageous as it appeared for its lightness, compactness, and greater security, without awaiting the final failure of the tank boiler? The answer is not possible unless it be admitted that some features existed in the tank boiler not to be found in the new one, and which could not be given up without profound consideration. These features consist in the composition and the distribution of the heating surface, the weaker part of which—the tubes—is not exposed to causes of failure peculiar to the water tube boiler, and in which the repairing of a tube failure is easier, and does not necessarily entail throwing the boiler out of work. The boiler illustrated is intended to retain the advantages of the tank boiler without its disadvantages.

The committee appointed by the admiralty in 1900 to consider certain questions respecting modern types of boiler for naval purposes formulated as follows* the three principal requirements of marine boiler from a tactical point of view.—(1) Rapidity of raising steam and of increasing the number of boilers at work; (2) reduction to a minimum of danger to the ship from damage to boilers from shot or shell; (3) possibility of removing damaged boilers, and replacing them by new boilers in a very short time, and without opening up the decks or removing the fixtures of the hull.

The first is very important, but it must not be estimated beyond its proper value, which should not be exaggerated, as M. Bertin says. The time required for starting the engines is shortened by the rapidity with which the boiler gets under steam, only because this rapidity admits of anticipating the heating of the engines, which operation takes several hours, according to the size of the machinery. The technical condition necessary to satisfy this first item is the activity of the circulation of the water. As to the security requirement, it must be taken in a relative sense. "On land, and in the neighborhood—not immediate—of the boiler," as M. Bertin says, "the water tube boiler gives an incontestable and full security; the effect of an explosion does not extend very far. But on board ship one can no longer speak of security after the disaster of the Sarrazin and of the Jaureguiberry." A condition that must be satisfied for this requirement consists in reducing the quantity of water; but an exaggeration in the reduction of the water leads to an extreme sensibility of the boiler to the variations in the running of the engines and in the managing of the fires. The third condition imposes either the adoption of small sized boilers which condition agrees with the preceding one, or of a boiler which could be taken to pieces of a size that can pass through the hatchways.

If to these requirements, to which the ordinary tank boiler does not answer, be added the principal defects of the same boiler, especially of the Scotch type, namely: (4) Deficiently proportioned furnace room; (5) shortness of the run of the flame and the hot gases; (6) unfitness for forced draft; we have before us the essential conditions to be satisfied in a design of a maritime fire tube boiler more properly intended for warship purposes.

The preceding considerations induced me to design and construct a type of fire tube boiler—illustrated by Figs. 1 and 2—which may be called a "marine boiler with tubular heaters." This boiler is composed of the following principal parts:—(1) The furnace compartment, or lower vessel. The furnace is of a box shape without bottom, the sides are inclined to the vertical line, the crown is of cylindrical form, the height above the grate is liberally designed as to the length of the grate. To the back plate of the furnace a tubular ring is attached, which constitutes a lengthening of the direct heating surface, and concurs in giving a good development to the flames beyond the bridge before they reach the combustion chamber. A box, wholly similar to the furnace case, constitutes the shell of the furnace compartment. Between the furnace case and the shell there is contained a water space. (2) Several tubular heaters—four according to the drawing—placed in two vertical rows above the furnace compartment, which are, like the latter, inclined to a horizontal plane. These heaters are cylindrical vessels of steel plate full of water, between the ends of which fire tubes extend, fitted as in tank boilers. The external surface of the heaters and the interior of the fire tubes are lapped by the flue gases. (3) An upper vessel, or steam chamber, which contains water in its bottom and the lower part of which is, like the superior heaters, lapped by the hot gases. (4) Circulation tubes, which are nearly vertically situated at both ends of the upper vessel, and set up communication between this vessel and the lower ones. There are two sets of these tubes, viz., the back and the front ones. The former act as return tubes, and extend from the bottom of the upper vessel to the bottoms of the other vessels. The latter start from the top of these lower vessels and carry into the superior vessel the mixture of steam and water. (5) The casing, which constitutes also the walls of the combustion chamber and of the smoke box, covered with either fire-bricks or non-conducting material, according to the temperature of the flue gases which come in contact with it. A diaphragm is placed in the casing between the lower and the upper heaters, which forces the gases to turn twice before they reach the base of the funnel. The boiler I have described is, I may say, an elementary one; but it is to be understood that beyond a certain grate area it is convenient that the boiler should be made up of two such elements having the water spaces and smoke boxes in common, as shown in Figs 3 and 4.

The principal data of the first boiler are the following:

Steam pressure	200 lb.
Direct heating surface	74.0 sq. ft.
Heating surface of the heaters and of the upper vessel	364.6 "
Total heating surface	438.6 "
Grate area	14.73 "
Water space	60.3 cu. ft.
Steam space	18.8 "
Weight of boiler, excluding uptakes and fittings	4.134 tons
Weight of the fittings, brickwork, and grate bars	2.263 "
Total weight of empty boiler	6.397 "
Total weight of boiler with water at normal level	8.067 "

And the principal data of the second one are:

Steam pressure	200 lb.
Direct heating surface	172.5 sq. ft.

The Engineer, March 15, 1901, page 275.

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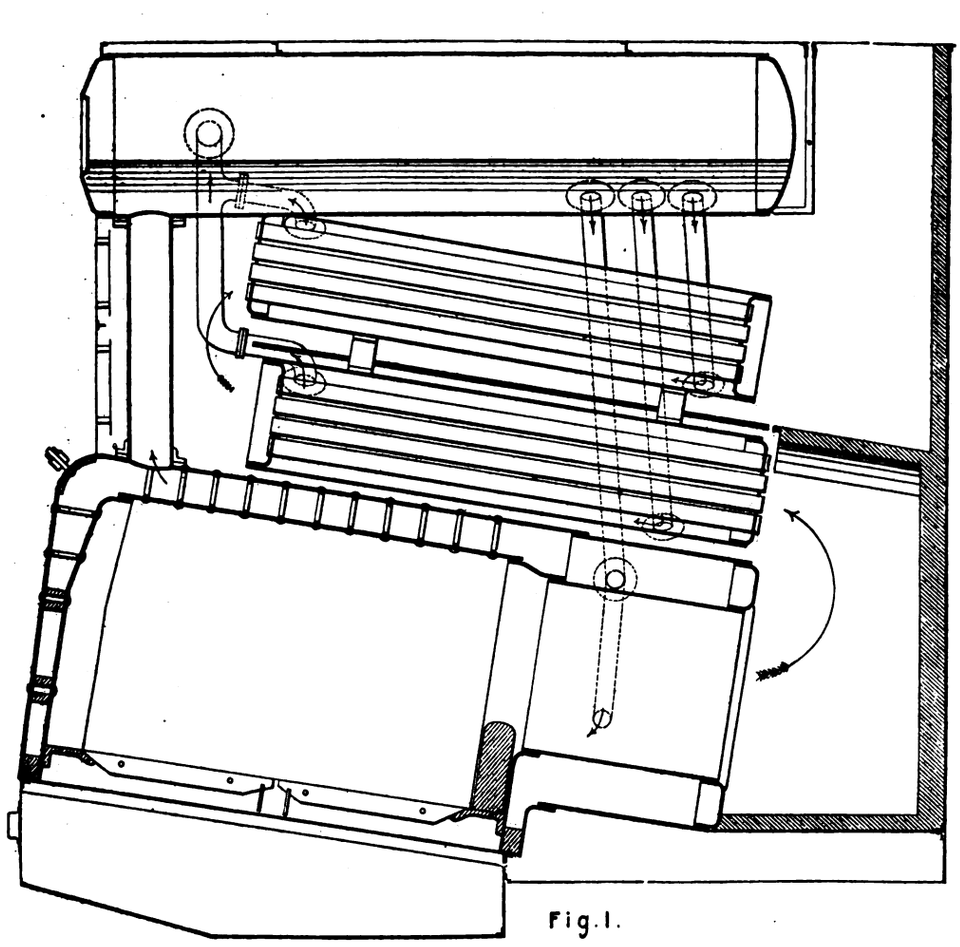

Fig. 1.

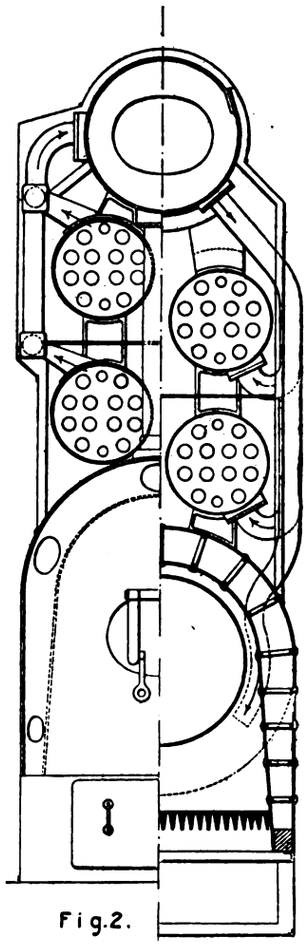

Fig. 2.

NEW TYPE OF MARINE FIRE TUBE BOILER.

Heating surface of the heaters and of the upper vessel	1010.3 sq. ft.
Total heating surface	1182.8 "
Grate area	38.7 "
Water space	191.4 cu. ft.
Steam space	67.3 "
Weight of the boiler, excluding uptakes and fittings	11.320 tons
Weight of the fittings, brickwork, and grate bars	3.307 "
Total weight of empty boiler	14.627 "
Total weight of the boiler with water at normal level	19.410 "

The saving of weight and space in such a boiler, as compared with the Scotch type is evident. On one side the weight of water is reduced because of the small water spaces, on the other side the suppression of the thick and large tube and shell-plates reduces by a considerable amount the weight of the metallic parts. This saving of weight is about 40 per cent for the metallic parts, and 60 per cent for the water, or in all about 50 per cent when comparison is made between a two-furnace boiler of this new type and a two-furnace single-ended Scotch boiler. This saving of space in the transverse sense is apparent, the breadth of the boiler under examination being only a little greater than the breadth of its grate. In the above instance this saving may amount to about 4 ft. As to the length and the height no variation is to be found between the two types of boiler, a diminution of the height being, moreover, possible beyond a certain diameter of the corresponding tank boiler. If we now compare the new type with water tube types of the heavy class, we find no appreciable difference in weight per indicated horsepower under low forced draft—½ in. water—and some advantage on greater draft—1 in.

No weak part of this boiler is exposed to the direct action of the flame. As to its durability, its furnace is not inferior to that of a locomotive, of which large experience has been made in the Italian navy. Moreover, an overheating of the furnace is very far from probable, as the space above is always full of water, owing to its position below the upper vessels. It is to be added, that in case of critical contingencies, drawing the fires may be attempted in this type of boiler. The composition of the boiler made up of various vessels connected by simple tubes, allows free expansion. As to the heaters, they are cylindrical vessels of small diameter immersed in an atmosphere of gases, which can freely expand, and leakage occasioned by the overheating of the tube plate which receives the impact of the flames is not admissible. It may be concluded that this boiler is in better condition of resistance than the tank type under forced draft.

As to the circulation of water, there is no doubt that, owing to the inclination of the inferior vessels, the steam tends to ascend towards the front end or top of these vessels, from which it is carried to the steam chamber along the corresponding circulation tubes. In these tubes, therefore, a current of steam takes place, and in consequence the said tubes and the back ones are in the same conditions of the two arms of the well known U-shaped tube, on which experiments have been made to show the circulation in water tube boilers.

A confirmation has been secured of the activity of the circulation by trials made on two models, one of which represented to the scale, 1:10 the furnace compartment and the upper vessel with the circulation tubes, and the other one the heater and the said upper vessel with the respective connecting tubes. Although from these trials it was not possible to deduce material results applicable to the boiler, yet they

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clearly showed how well the circulation took place, and in the pre-arranged manner, and how speedy was the steam flowing in the downcomers.

A series of evaporation trials has been conducted with the boiler corresponding to Figs. 1 and 2, under the supervision of a committee appointed by the Italian ministry of marine The trials, in number eight, were made under natural and forced draft—½ in. to 1 in. water—at 200-lbs. steam pressure. The boiler was placed on the shore, partially covered with an asbestos mantel. The steam was allowed to blow freely to the atmosphere. Feed was maintained continuously, and was so regulated that the oscillations of the pressure could not exceed 15 lbs., which were also lessened by controlling the steam valve. In order to ascertain exactly the quantity of evaporated water each feed pump was supplied by two tanks previously gauged, from which the pump derived its suction alternately. The fuel was hand-picked Cardiff. Its thermal power was determined by the Thomson calorimeter at the metrical department of the Spezia dockyard. The temperature at the base of the funnel was taken by a Gabler metallic pyrometer.

The annexed Table I contains the results of the trials, which are completed by the following remarks in the committee's report:

(1) Circulation of water: Steam can be raised from cold water in one hour, and it is possible to shorten this time. The return circulation tubes, which are external to the boiler, become hot in a quarter of an hour after the lighting of the fire. Nothing has been observed during the various trials that might point to disturbance or deficiency of circulation.

(2) Run of the hot gases: The high rates of combustion that have been attained with a satisfactory efficiency, show that in this boiler a longer run of the gases is accompanied by a diminished resistance along the flue as compared with the Scotch boiler.

(3) Behavior under forced draft: No drawback has been manifested on the last trial made under forced draft. The committee believe that it is possible to surpass the pressure of 1 in. water up to 1½ in. and more, without drawbacks.

(4) Efficiency: When acting under natural draft the rate of combustion per hour and per square foot of grate may be maintained at 17.2 lbs. and over, up to a maximum of 23.2 lbs. The actual evaporative power of 1 lb. of coal is 8.71 lbs. when the rate of combustion is the lower one, and the efficiency of the boiler rises to 71.72 per cent. These figures are not so high when the rate of combustion is increased, and beyond the above-mentioned maximum rate of combustion, it appears convenient, both from the economical and evaporative point of view, to use forced draft. When forcing slightly—½ in. water—a rate of combustion of 35 lbs. per square foot of grate may be maintained, to which figure corresponds an evaporative power of 8.77 lbs. of water per pound of coal and the efficiency of 72.22 per cent. Increased forcing lowers the figures, the evaporative power being of 8.09 lbs. and the efficiency of 67.26 per cent when the water pressure is 1 in., and the rate of combustion 45.9 lbs. per square foot of grate and per hour. It may be stated that the evaporative power of the boiler is doubled by acting under low forced draft, and tripled when moderately forcing at a higher rate.

(5) Weight: Table II contains data of comparison between this boiler and the Scotch or Niclausse, and from these figures the former appears much lighter than the Scotch type. Under low forced draft no remarkable difference exists between this boiler and the Niclausse, while the former becomes lighter under an admissible higher rate of draft.*

(6) Space. The saving of the space in the transverse sense realized by the new type is evident, whereas there is no appreciable difference as regards length and height.

TABLE I.

Number of trial	Duration of trial, hours	Steam pressure	Air pressure in closed ashpit, in. water	Average quantity of coal used per hour	Average quantity of coal used per hour and per sq. ft. of grate	Average feed-water pumped into the boiler per hour	Actual Evaporation per lb. of coal	Actual evaporation per sq. ft. of heating surface per hour	Equivalent evaporation per lb. of coal from and at 212 deg. Fah.	Calorific value of coal per lb.	Weight of ashes	Thermal efficiency of the boiler	Average temperature of feed-water. Deg. Fah.	Average external temperature. Deg. Fah.	Average temperature of flue gases. Deg. Fah.	Heat transmitted per sq. ft. of heating surface per hour
		lbs.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	B.T.U.	Per ct.	Per ct.				B.T.U.
I.	12	200	nil	258	17 2	2207	8.71	5.03	10 50	14,157	5.12	71.72	64	75—86	545	5,837
II.	6	200	nil	323	21.9	2497	7 74	5.19	9.33	14,157	7.43	68.73	64	82—86	585	6,621
III.	6	200	0.5	517	35.0	4532	8.77	5.32	10.57	14,157	2.62	72.22	64	84	608	12,010
IV.	6	200	nil	342	23.2	2545	7.45	5.80	8.98	14,157	6.59	61.41	63	75—84	518	6,758
V.	3	200	1.0	735.5	50.0	5911	8.03	13.48	9.66	14,355	4.29	65.25	64	84	725	15,710
VI.	3	200	1.0	675	45.9	5456	8.09	12.44	9.75	14 018	4.02	67.26	64	75	644	14.465
VII.	6	200	nil	319	21.6	2622	8.22	5.98	9.91	14.168	6.32	67.63	64	77	552	6,948
VIII.	4h.57m.	200	nil	300	20.4	2422	8.07	5.52	9.75	13,801	10.66	68.31	63	79	574	6,426

TABLE II.

Data	New type boiler	Single-ended Scotch boiler			Niclausse boiler
		Steamer D. Manin	Steamer Doris (fitted with the Howden draft)	Steamer Baldo	Armored cruiser G. Garibaldi
Steam Pressure, lb	200	160	180	100	205
Grate area, sq. ft.	14.78	115.7	126.9	82.25	45.2
Indicated horsepower under natural draught	*160	1250	—	310	414
" " " ½ in. forced draft	*290	—	1900	—	613
" " " 1 in. forced draft	*350	—	—	—	—
Weight of boiler, including fittings, excluding uptakes and funnel, tons	6.397	74.045	100.070	16 740	14.490
" " water, tons	1.670	35.430	41.890	8.170	2.705
Total weight, tons	8.067	109.475	141.960	24.910	17 195
" per indicated horsepower under natural draft, lbs	113	195.8	—	180	93
" " " " " ½ in. forced draft, lbs	62.3	—	166.9	—	62.8
" " " " " 1 in. forced draft, lbs	51.6	—	—	—	—

* These figures are obtained by taking at 15.5 lbs., the feed-water required per indicated horsepower and per hour.

The steel yacht Arcadia, owned by Commodore Baum, of the Chicago Yacht Club, carried a Shipmate range which quite likely contributes to her well-known reputation for comfort and hospitality. This range is manufactured by the Stamford Foundry Co., Stamford, Conn.

*It is to be remarked that a further saving of weight should be attained with the double furnace new type boiler.

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FREIGHT SITUATION.

Shifting of boats at Lake Erie ports for coal cargoes has continued throughout the week and at all of the coal receiving ports vessels are holding coal for the opening of navigation. Probably more coal is handled today than at any time prior to actual navigation before. Indications still point to an early opening though vessel owners will not attempt to force the opening as they did last year. That exepriment proved not only costly but actually delayed the opening for the vessels that attempted it, as all had to go into dry dock. There is ice in the rivers but not much in the lakes, and it is not expected that the same difficulty will be experienced this year as was experienced last. Interest, however, attaches to the stages of water, the levels being somewhat lower than last year and for opening trips at any rate the boats will not load to a greater draught than 18 ft. Shortage in coal exists at upper lake ports and a number of vessels that do not usually bother with that commodity will carry it on the opening trip. Coal chartering has opened at 30 cents to the head of the lakes which is the same rate as was paid last year.

STEEL CORPORATION TO LEASE HILL LANDS.

Contracts have been drawn for the leasing of the iron ore properties on the Mesabi range controlled by James J. Hill of the Great Northern railway for a term of thirty years to the United States Steel Corporation. By the terms of the contract the Steel Corporation is to pay 70 cents per ton for ore mined during the first two years and 80 cents for carrying it to Duluth on the Great Northern railway. At the expiration of two years the price is to be increased 5 cents a ton every two years until at the end of twelve years the price shall be $1 and stay at that figure for the remaining eighteen years of the lease. The Great Northern, moreover, is to be guaranteed freight amounting to 10,000,000 tons annually during the life of the lease. This leasehold does not include all of the Hill lands as some of them are already under leaseholds to independent interests but the deposits involved in this deal are estimated as containing 300,000,000 tons. While the contract for a transfer of this property has not been definitely signed as yet, it is understood that it will be.

LAUNCH OF STEAMER ABRAHAM STEARN.

The steamer Abraham Stearn, building for the Hawgoods of Cleveland, was launched from the West Superior yard of the American Ship Building Co. on Wednesday of this week. The steamer was christened by Miss Josephine Ross, of Duluth. Mr. and Mrs. W. A. Hawgood, Mr. F. P. Smith and Mr. Roy Williams, of Cleveland attended the launch. The Stearn is 545 ft. over all, 525 ft. keel, 55 ft. beam, and 31 ft. deep, and is equipped with triple expansion engines and Scotch boilers. She will be commanded by Capt. C. C. Balfour who last year sailed the Bransford.

OBITUARY.

Capt. Alexander Begg died at his home in Bay City on Monday night last. He was compelled to leave the steamer M. A. Hanna of the Mitchell fleet last fall owing to illness. Capt. Begg was fifty-two years old and was well liked along the whole chain of lakes.

Capt. Charles Scott, for over half a century a captain on the lakes, died of pneumonia in Cleveland last week. He was born in Port Covington, N. Y. in 1833. He went to Cleveland in 1849 but had prior to that time sailed on the ocean. He retired from active service on the lakes about ten years ago.

Henry C. Kelley, assistant superintendent of the Kelley's Island Lime & Transportation Co., was accidentally killed by a street car on Euclid avenue, Cleveland, on Sunday last. He was a resident of Kelley's Island but had been in Cleveland visiting his brother. Mr. Kelley was born at Kelley's Island. He was about forty-eight years old.

John Stanton, the first president of the old New York Mining Exchange, and one of the best known copper men in mining circles, died at his home, 419 West Twenty-third street, New York, on Friday last. Mr. Stanton was in no sense of the word a speculator and for that reason probably was little known to the general public, but in the copper industry itself he was a foremost figure. He was intimately associated with the development of the copper mines of the Lake Superior country, having gone into that region as early as 1852. Among the properties which he developed there were the Mohawk, Baltic, Michigan, Winona and Wolverine properties. He was of a quiet and unassuming nature but his judgment as a mining engineer was of the highest character and he was much sought after. He amassed a great fortune in the trade, estimated at about $10,000,000. Hutchinson & Co., of Cleveland, named one of their latest vessels after him, Mr. Stanton personally attending the launch at the Lorain yard of the American Ship Building Co. last fall. Mr. Stanton was born at Bristol, Eng., and was seventy-six years old.

AN INSTRUCTIVE COURSE OF LECTURES.

Capt. Thomas Donnelly is giving a course of lectures on practical navigation at Kingston, Ont., which are being very well attended. Recently two lake masters commanding steel steamers out of Cleveland, attended one of the lectures and complimented Capt. Donnelly highly upon his ability as an instructor. They gave credit to the interest in the meetings to the practical and interesting blackboard instruction which appeared to them as being the plan necessary to be followed to interest the masters in the lectures. Capt Donnelly makes his lectures of practical value by referring to collisions and strandings that have taken place in recent years on the lakes. He has the decisions of the courts at hand and does not refer to a case unless it has been settled. He then tries to show how the master in charge might act in navigating his vessel in such cases according to the rules.

CALENDARS.

Magie Bros., 9 and 11 North Canal St., Chicago, dealers in cylinder engine and dynamo oil, have just issued a calendar advertising their Rock Brand oils. The illustration upon this calendar is a photogravure of a photograph by C. H. Anderson from the living model. It represents a young woman in a statuesque pose and from the photographic standpoint is excellent.

The Cleveland Pneumatic Tool Co. has issued one of the most beautiful calendars of the season, taking for the pictorial element one of Asti's half-length figures of a young girl. The painting has been faithfully reproduced and is in fact an exquisite specimen of the printer's art.

The important dredging work in the Duluth-Superior harbor will be started as soon as the ice is out of the bay. A channel about 2,500 ft. long, 250 ft. wide and 20 ft. deep will be dredged from the north channel of the Mesabi ore docks directly across the bay and connecting with the south channel on the Superior side. Contract for this work has been let by the Duluth, Mesabi & Northern Railway Co. to the Great Lakes Dredge & Dock Co., Chicago.

The Dalzell bill incorporating the Lake Erie & Ohio River Ship Canal Co., passed the house of representatives this week by a vote of 196 to 81. The bill now goes to the senate.

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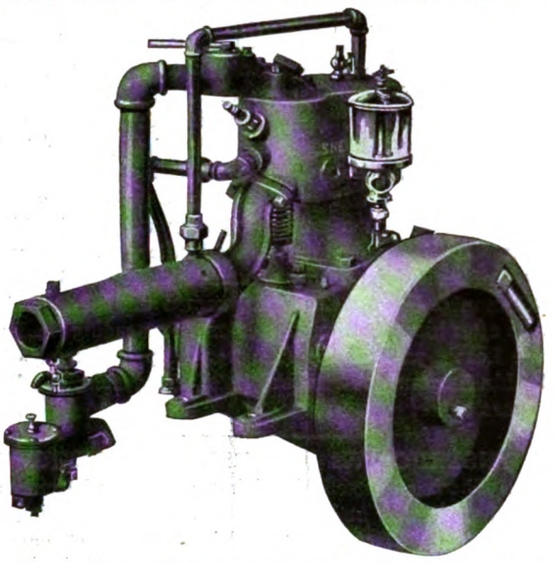
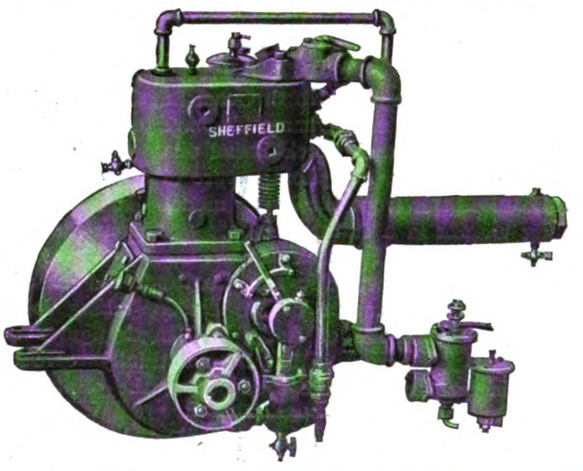
SHEFFIELD MARINE ENGINE.

Realizing the constant increasing demand and the usefulness for a practical and inexpensive power for small boats, yachts and luggers, Fairbanks, Morse & Co., of Chicago, have decided to bring out a four-cycle engine of the simplest possible construction, with as little weight as is possible in modern engine practice. The type of engine is of vertical construction, with an enclosed crank case, made with movable bearing plates, in which are mounted movable liners. The



base is provided with hand hole plates, affording easy access for adjusting and inspection. The crank case being closed and oil tight, the engine is operated on splash lubrication. An entirely different method, however, is used from that ordinarily followed, as there is arranged inside of the base an oil separator, removing any heavy or foreign properties from the oil, preventing them from re-entering the bearings.

The cylinder is water jacketed as well as the head. The head is cast integral with the cylinder. In this way there is no joint to pack or blow out. The valve chambers and



valves are thoroughly water jacketed, thus making the engine of long life and high efficiency. All valves are readily removed by loosening a bolt and swinging off the cover. The ignition is of the jump spark type. Commutator is independent, removable and renewable type, arranged to be shifted to vary the time of ignition. The mixer is of the float feed carbureter type, arranged with lever throttle for varying the quantity of mixture admitted to the engine. The regulation is such that the highest efficiency is attained at all speeds. The engine has a wide range of speed by means of a throttle and a spark. The oiling system for supplying oil to the cylinder and other parts is provided from an oil cup on the cylinder. A small circulating pump is attached to the engine for assisting circulation of the cooling water through the engine jacket. The gearing is cut and runs in an oil bath, thus making it quiet and reducing the wear to a minimum. The crank shaft is made of nickel steel. Connecting rod is drop forged. Igniter is jump spark type. Carbureter is of the float feed throttle type. Pump is arranged so that it can be easily drained in cold weather. The muffler is water jacketed and thoroughly efficient. The thrust bearing is of the ball bearing type, liberally constructed and attached to the crank case. The coupling is close to the crank case, making a neat and compact arrangement. The size of engine now ready for the market is 4½ H. P.

A GRAPHIC ILLUSTRATION.

On salt water the proposition of a preventative against fouling of hulls, particularly iron and steel hulls is an important one and is being studied by everybody interested in the business. The Marine Paint Corporation, of Norfolk,

FIG. 1.—HULL OF THE TUG JACK TWOHY.

Va., has placed in the market a non-corrosive and non-fouling paint which has attracted a great deal of attention and favorable comment and experiments with these compositions have been eminently satisfactory. In the accompanying illustrations is shown a section of two hulls, painted within a few days of each other and hauled out for examination at the

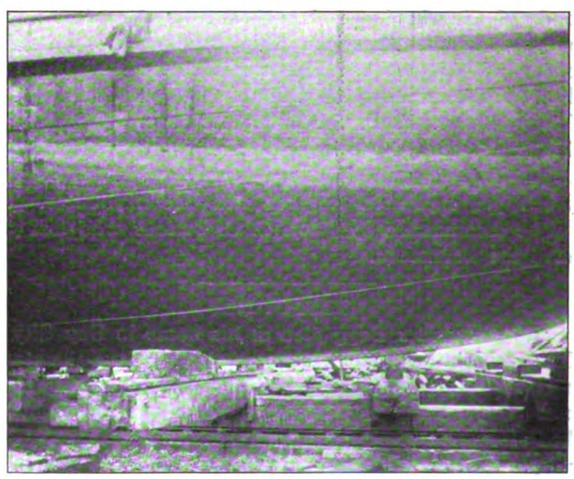


FIG. 2.—HULL OF THE TUG E. V. MCCAULEY.

same time for the purpose of comparison. Fig. 1 shows the hull of the tug Jack Twohy, of the Lamberts Point Tow Boat Co., of Norfolk, painted Aug. 4, 1905 and hauled out four months later with bottom very foul and very rusty. Fig. 2 shows the hull of the tug E. V. McCauley, of the same

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company, painted July 31, 1905 and hauled out at the same time the Twohy was hauled out but with bottom almost perfectly clear from any marine growth and the iron under the paint perfectly protected from all corrosion. The McCauley had been painted with the Marine Paint Corporation's product and the Twohy with another product. For this paint it is claimed it will stick equally well above and below the water line and preserve an unbroken casting which prevents fouling as well as pitting.

MR. WALLACE ON THE PANAMA CANAL.

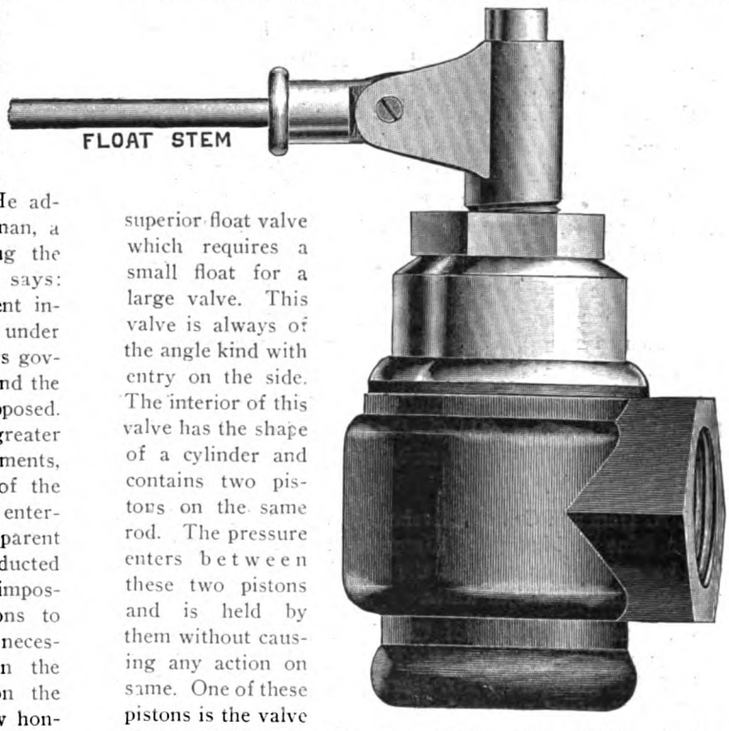
In the *Engineering Magazine* for March, Mr. John F. Wallace, formerly chief engineer of the Panama canal, continues the account of his experience during the year in which he was in charge of construction work in the canal zone. In this article Mr. Wallace declares it to be his belief that it will require more time and money to construct a high level canal on the 85-foot plan on the present method of government control than it will to construct a sea-level canal, provided the work is accomplished by modern efficient business methods. He advocates either placing the work in the hands of one man, a practical engineer with unlimited authority, or letting the work to one large contracting firm. Continuing he says:

"Of the factors which exercise the greatest deterrent influence in the accomplishment of satisfactory results under direct governmental control the first is found in the laws governing the disbursement of public funds. The official and the commercial ideals are evidently diametrically opposed. Whether, after all the governmental methods secure greater honesty, or less scandal in connection with disbursements, can best be judged by a comparison of the history of the government bureaus with that of our great engineering enterprises under corporate management. It should be apparent to every thinking man that when the work must be conducted 2,000 miles away from a seat of government, a policy imposing the necessity of referring all important questions to Washington and submitting them there to men who necessarily cannot be conversant with the conditions on the isthmus unless they are informed by the parties on the ground, cannot give satisfactory results, no matter how honest or efficient the supervising officials may be. I may perhaps feel too strongly on this point, but my experience at Panama—my occasional contact with governmental methods reaching back to a service of five years as assistant engineer on river and harbor improvements, has convinced me that attempts to carry on constructive work under the direction of Washington bureaus, especially when the work is large, complicated and distant from the seat of government—are conducive of extravagance and waste, as to both time and money. I am emphatically of the opinion that governmental functions on the isthmus should be confined exclusively to a general supervision of the work and enforcement of such simple ordinances and sanitary regulations as may be necessary to secure the peace and the health of the community affected by the constructive work.

"If the experience had not been so serious I should look back to my first connection with this enterprise and the experience gained therewith and smile to think I had been so innocent as to suppose myself able to overcome the long settled influences heretofore indicated, or to impress my individuality upon the work or employ in it the methods with which I had been familiar for years. The usefulness of any man who might be called in as an engineer of demonstrated capacity to supervise an enterprise of this character is naturally measured by the extent to which he may be premitted to use his own methods and make available the result of his past experience. To expect that any person who is really qualified to conduct the work will radically change his methods, which have been the outcome of a lifetime of experience and adapt himself to mossgrown government methods, is to expect the impossible. It demands that a man should be content to ignore the instincts of his profession and subject himself to the various influences brought to bear upon him, drifting along in a perfunctory way, satisfied to draw his compensation, hoping that in some way or other he may be able eventually to see the work completed, or wasting the best years of his life in the partial accomplishment of it."

CALDWELL IMPROVED BALANCED FLOAT VALVE.

The Caldwell improved balanced float valve, represented in the accompanying cut, is a balanced water valve that can be easily operated under any reasonable pressure, making it a very superior float valve which requires a small float for a large valve. This valve is always of the angle kind with entry on the side. The interior of this valve has the shape of a cylinder and contains two pistons on the same rod. The pressure enters between these two pistons and is held by them without causing any action on same. One of these pistons is the valve disk. This one fits the valve seat tightly, leather being used between the two metal surfaces to perfect the seat. The other piston is made to move and retain a tight joint with the inside of cylinder by means of a cup-leather. This piston is necessary to balance the moving parts of the valve, and packs the end of valve. The valve stem protrudes and is joined with the lever operating it, making the valve self-packing. All the parts contained on the valve stem are secured to the same by the nut on the lower end, making it easy to assemble these parts and hard to derange them. All of these parts can be removed from the body of the valve without disconnecting same from pipe line, by unscrewing the brass cylinder. You can then attend to any part of valve. The lever containing float can be turned in any direction that may suit the user. The vertical angle of lever can be changed by screwing or unscrewing the bracket that sustains the lever.



Directions.—Connect the valve so that the stem will be vertical with lever on top. Always let pressure enter side of valve. The valve does not require to be in the tank to be filled, but can be used outside in any position suitable. The valve can be used in any kind of liquid that will not destroy the leather. For enclosed vessels, such as feed water heaters, we can furnish plans and parts to connect valve, at but little additional cost, so that it will be on the outside of vessel and be automatically operated by float in the vessel. The valve cannot be used where there is very much back pressure. When used in fluids that destroy leather, we supply special metallic packing instead.

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AROUND THE GREAT LAKES.

Contract for the construction of the new addition to the Northwestern Fuel Co.'s dock at Duluth has been let to Frankman Bro. & Morris, St. Paul.

Capt. H. G. Haybarger will bring out the steamer W. G. Pollock, building at the Cleveland yard of the American Ship Building Co., for W. H. Becker.

The steamer Desmond, owned by Fritz Reivenach, Alpena, Mich., has been purchased by the Detroit River Transit Co., of Detroit. She will hereafter be used in the sand trade.

Capt. Daniel C. Sullivan will bring out the steamer E. J. Earling, which is building at the West Superior yard of the American Ship Building Co., for H. W. Oakes, of Detroit.

Capt. Everett L. Ennes of Put-in-Bay will bring out the steamer J. B. Wood of the Gilchrist fleet now building at the West Bay City yard of the American Ship Building Company.

The steamer Charles Rietz has been sold by J. O. Nessen & Co. of Manistee to Burns Bros. of Detroit. The Rietz is 127 ft. long and 26 ft. beam and has been in service since 1872.

The barge Manila of the Pittsburg Steamship Co.'s fleet has been pulled off the rocks at Encampment Island and taken to Duluth where she will be repaired as soon as she can get a dock.

The wooden barge Wm. McGregor, which was purchased last season by Capt. H. C. McCallum from the Vulcan Transportation Co., of Detroit, has been sold to Fritz Reivenach, of Alpena.

M. A. Hanna & Co., of Cleveland, have leased the old American mine at Humboldt, Marquette range, and operations will be resumed as soon as the machinery can be installed and the mine cleared of water.

Mr. Henry Hawgood, of Cleveland, will name the new steamer building for him at the Lorain yard of the American Ship Building Co., after Mr. Harvey D. Goulder, counsel for the Lake Carriers' Association.

The steamer Wm. A. Paine was taken from Lorain to Cleveland in tow of the tugs Alva B. and Fabian last week. The trip was made in 2 hours and 50 minutes. The tugs had no difficulty in taking the steamer to the Ellsworth dock.

Navigation between Detroit & Cleveland will be opened next week, if possible. It is the intention to have the City of Detroit leave Detroit on Monday night and if she succeeds in doing so it will be the earliest opening between the two ports for many years.

The warm sun last week started the ice jam in St. Clair river. The big steel steamer W. W. Brown, belonging to the United States Transportation Co.'s fleet which was moored at Thompson's dock, Port Huron, was torn from her fastenings and became fast above the middle ground.

The Detroit & Cleveland Navigation Co. has purchased 420 ft. of river frontage from the Jones estate running from Shelby street to the White Star line docks. The property was formerly used by the old Eber Ward line steamers and also by the Crescent line steamers.

The package freight steamer Arabia has been purchased by G. E. Jacques & Co., Montreal, from Frank Upton, of Charlotte, N. J. The Arabia is 220 ft. long, 34 ft. beam and 14 ft. deep. She originally belonged to the Western Transit Co., but was turned over to the Great Lakes Engineering Works a year or two ago.

A convention to include all the governors, United States senators, congressmen and representatives of the great commercial interests of the Mississippi valley is being arranged for under the auspices of the Business Men's League of St. Louis, to crystallize sentiment in favor of the improvement of the Mississsippi river.

The big steamship Roanoke, damaged by striking heavily on Humboldt Bar, has been repaired and is again ready for service. The contractor has lost $6,000 in the way of a penalty. He was to complete all repairs within 25 days, or to forfeit $200 each day over that period. As it required 56 days in which to complete repairs, the contractor has lost heavily on the job.

On March 22 the advisory board of engineers will open bids for the construction of the Michigan Central's tunnel under the Detroit river. The length of the tunnel including approaches will be 12,800 ft., of which 2,625 ft. will be under water. The cost of the tunnel is estimated at from $7,000,000 to $8,000,000, and it is expected to have a capacity for handling 4,000,000 cars per annum. The Michigan Central at present moves about 400,000 cars per annum but of course other roads are expected to use the tunnel.

The Stanley B. Smith Coal & Dock Co., a corporation which has been doing a fueling business in Toledo, has been sold to Wm. O. Henderson, trustee, of Columbus, O. The Stanley B. Smith Coal & Dock Co. will cancel its charter and go out of business. This has nothing to do with the partnership of Stanley B. Smith & Co., of Detroit, or with the business of Smith's Coal Dock, River Rouge. Stanley B. Smith & Co. and Smith's Coal Dock are still owned by the partnership of Stanley B. Smith & Co. and will continue to run the same as in the past.

The American Seamen's Friend Society, 76 Wall street, New York, have issued in bound form the 77th volume of the *Sailor's Magazine*, the price of which is $1.50. Throughout the year this little magazine contains a great deal of excellent

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DATA OF FOUR HOURS' FULL POWER FORCED DRAFT PRELIMINARY TRIAL OF U. S. S. LOUISIANA, AT SEA FROM ROCKLAND, ME., TO BOSTON, MASS., DECEMBER 14, 1905.

	STARBOARD	PORT
Maximum average revolutions per minute for fifteen minute period	128.57	128.40
Average revolutions per minute, four hours	127.66	127.69
Mean revolutions per minute, both engines	127.68	
Maximum steam pressure at boilers, in pounds	276.0	276.0
Average steam pressure at boilers, in pounds	270.4	
Maximum steam pressure at engines, in pounds. H P Steam Chest	247.0	245.0
Average steam pressure at engines	242.1	236.5
Maximum air pressure in fireroom	2-1"	
Average air pressure in fireroom	1-98"	
Maximum vacuum, each engine	27"	26-9"
Average vacuum, each engine	26-5"	26-5"
Collective I. H. P. of all main engines	20,442-5	
Collective, main engine, air, circulating, feed and Hotwell pumps	20,747-57	
Collective, main, and all auxiliary engines in operation during trial	21,350-47	
Collective, main and all auxiliary engines in operation during trial, per square foot G. S.	19-06	
Kind and quality of coal used on trial	New River Hand Picked	
Average pounds of coal used per hour during trial	42,112	
Pounds of coal per hour used by main and all auxiliary engines in operation during trial	1-9.727	
Pounds of coal per hour used by main engines, air, circulating, feed, and Hotwell pumps	2.03	
Pounds of coal per hour used by main engines alone	2.06	
Pounds of coal per hour used per square foot of G. S.	38.39	
Draught at beginning of trial (forward)	24'-6½"	
Draught at beginning of trial (aft)	24'-8½"	
Mean draught at beginning of trial	24'-7½"	
Corresponding displacement at mean draught at beginning of trial	16,055 tons	
Draught at end of trial (forward)	Not taken	
Draught at end of trial (aft)	do	
Mean draught at end of trial	do	
Corresponding displacement at mean draught at end of trial	do	
Corresponding displacement at mean draught during trial	do	
Speed of ship in knots per hour	18.823	
Slip of propellers in per centum of their own speed	16.99	17.01

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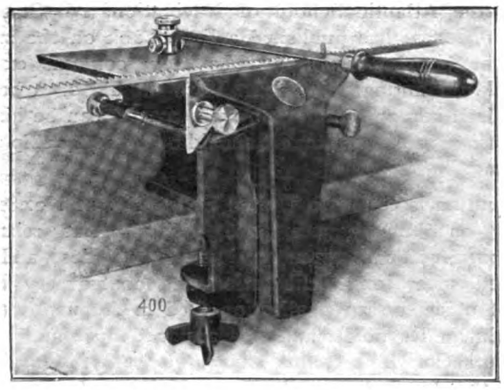
A NEW BAND SAW FILER.

The New Britain Machinery Co., New Britain, Conn., has recently brought out a device for filing band saws, which is shown herewith. It is claimed by the maker that the band saw that is filed by hand cuts better than one filed by machine, and the present device has been brought out to accomplish hand filing in the easiest and quickest manner. In order that a band saw blade should cut free and for the longest time without attention, it must be sharpened with regard to four conditions.

First—It is most essential that the tooth must be sharpened squarely across. To do this the file should be held



DEVICE FOR FILING BAND SAWS.

perfectly level at a right angle with the saw, otherwise the cutting points of the teeth on one side of the saw will be in advance of those on the other side and the saw will not follow a line but will lead to one side.

Second.—The top of the teeth should be filed last. The end to be gained by this is a shape of tooth such as shown in Fig. 2. If this is not done the teeth will be similar to those shown in Fig. 3, having a burr on the point which will drag, and soon break off, leaving the saw dulled.

Third—The desirable amount of hook to the tooth should be determined and maintained. As much hook as can well

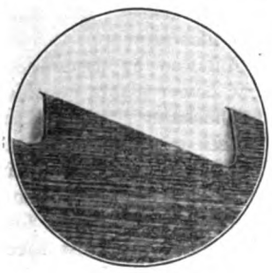


FIG. 2.

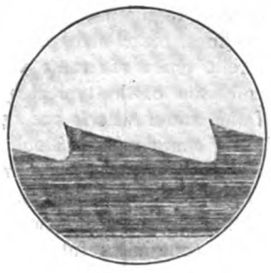


FIG. 3.

be given by a three-cornered file cuts the best and the saw will clear itself in ordinary work on dry and short grained woods. Less hook is desirable on wet or stringy woods where straighter teeth work better.

Fourth—The teeth should have even jointing that full efficiency may be obtained from each cutting tooth.

The art of filing consists largely in acquiring the feel of the file when working horizontally. In this the eye is not much of an aid, as no one, while working, can stand at one side and view the file to see that it is held level.

The New Britain filer has been devised to enable one to fill the above conditions. With this device the file is guided mechanically in a horizontal direction and also prevented from turning in the hand.

These guided movements determine the contour of the tooth, remove any tendencies to variations in the shape, and limit the personal skill required. The operator is simply called upon to see that the file goes squarely across, and the eye is sufficient guide when above the file for square filing.

The device consists of a vise which can be quickly clamped to a table, but in which the saw is not clamped between every few teeth.

A spring with adjustments and cast-off serves to regulate the pressure of the accurately hardened and ground jaws, which are guaranteed to hold any saw without chattering. A slight pressure of the file from right to left will carry the saw along with it, as the pressure in this direction tends to release the jaws enough to allow the saw to slip and when the pressure is removed the saw is firmly held as above noted. This feeding feature is regulated by a stop pin at the right of the fixed jaw, which prevents overrunning of the file when sharpening or feeding as described. The saw, however, can be easily released when desired by a touch of the lever at the right of the device.

There is but one adjustment to make on the vise itself ordinarily, this being to set the under gauge to the back of the saw so that the teeth will project enough to allow the file to pass through freely. The gauge works in parallelism and is held by a single thumb screw. No adjustment for different thicknesses of saws is necessary, as the vise automatically clamps any ordinary gauge of saw. A special file is furnished with the device, which has rounded corners that prevent checking or cracking of narrow band saw blades, which frequently break from the sharpened corners at the gullet of the teeth as left by sharp-edged tools. The point of the file is carried in a roller guide device which holds the same to any level required and which may be rotated to the proper angle for any desired hook to the teeth. These two adjustments of the file may be changed with relation to each other or they may be fixed and the file firmly clamped by set screws. The hardened rollers on the polished plate do not impede the action of the file, although they control and guide it.

Figs. 2 and 3 show teeth which have been filed by machine and filed by hand. In Fig. 3 the burr thrown up is clearly seen, and which should be removed by hand filing, before the saw is used.

INSPECTORS' TESTING AND PROVING OUTFIT.

The Ashton inspectors' testing and proving outfit, illustrated by the accompanying cut, is particularly designed to meet the requirements of boiler and power plant inspectors, mechanical and chief engineers, as it is accurate, durable, light weight, and easily portable. The outfit consists of the following nickel-plated instruments: Three-inch standard test gage, screw test pump, gage hand puller, hand set, lever handle union gage cock and screw driver, all neatly and compactly contained in velvet-lined leather case, fitted with lock and handle. The approximate weight of this outfit is 8 lb.

ASHTON PROVING OUTFIT.

George Morrell, general manager of the Seattle Shipping Co. of Seattle recently visited San Francisco to negotiate for additional vessels for the Nome trade.

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TRADE NOTES.

The Watson-Stillman Co., 46 Dey street, New York, has just issued another catalog devoted to hydraulic jacks. There are included in it a number of new sizes and new cuts which do not appear in the earlier edition. This catalog should be secured by everyone interested in jacks and filed.

The Means Foundry & Machine Co., Steubenville O., has just issued a catalog concerning bronze and brass castings. The company has met with fine success in the manufacture of castings. Their phosphor bronze bearings possess a peculiar toughness and wearing ability. The catalog is well illustrated and can be had for the asking.

The American Machine & Manufacturing Co. of Cleveland has secured an order from the Lorain yard of the American Ship Building Co. for two 7-ton cranes of 58 ft. 6¼ in. span and four 7-ton cranes of 48 ft. 6¼ in. span. The company is completely modernizing its plant at Lorain and will make it the most capacious of its numerous yards.

The Westinghouse Machine Co. has opened a Philadelphia sales office in room 1003 North American building. The establishment of this office was necessitated by their rapidly expanding business in this territory, particularly in gas engines and Westinghouse-Parsons steam turbines, and is in line with the progressive policy of the company to establish headquarters in all industrial cities.

The American Boiler Cleaner Co., 508 Broad St., Bank building, Trenton, N. J., has just put out a little catalog describing the American Boiler Flue Cleaner. The illustrations of the cleaner are printed on one page and a description on the other making it quite graphic. The little catalog will be sent to anyone upon request. Included in it are a number of endorsements of the device.

During the first two weeks in February the Westinghouse Machine Co. took some of the largest orders that were ever awarded to the East Pittsburg works since the Westinghouse-Parsons steam turbine has been introduced. Among these orders was one for the Phosphate Manufacturing Co., of Lakeland, Florida; Columbia Electric Street Railway, Light & Power Co. of Columbia, S. C.; Citizens Light & Power Co., of Adrian, Mich.; Pennsylvania Light & Power Co., of Allegheny, Pa.; E. J. Dupont Co., of Wilmington, Del.; The Kennebec Light & Heat Co., of Augusta, Me.

The Independent Pneumatic Tool Co., First National Bank building, Chicago, has found the present capacity of its plants at Aurora, Ill., insufficient to meet the demands for Thor pneumatic tools and it has therefore leased the large building adjoining the plant and says that it will purchase $50,000 worth of new machinery for installation therein at once. The company's domestic business has grown to such an extent that it is several months behind on orders. A cable order was received last week from London for 300 Thor pneumatic tools, being an addition to an order for 200 Thor pneumatic tools received from the same source about three months ago.

The New Jersey Paint Works, corner Wayne & Fremont streets, Jersey City, N. J., manufacturers and exporters of marine paints, have recently put out a calendar in which the products of their plant are well advertised. The calendar shows an illustration of a board, one end of which was painted with New Jersey copper paint and the other end left unpainted. The board was placed in salt water at Port Royal, South Carolina, for five months. The ravages of the salt water worm upon the unpainted end of the wood are plain to be seen, whereas no appreciable difference is noted in the painted end. This exhibition of the virtue of the paint is very convincing.

The Bourne-Fuller Co., of Cleveland, O., has just issued a catalog concerning Scott's crucible tool steels. These steels are fully guaranteed and any steel proving defective for the purpose specified will be replaced. The steel is made of the best possible raw materials. The utmost care is exercised in the manufacture and inspection of every bar.

A tasty little booklet has been issued by Benjamin Varnum How, Boston, Mass., general agent of the Arbecam Nautical Instrument Co. It shows how to find the magnetic bearing, magnetic course, ship's position, deviation of the compass and how to adjust the compass by the use of Arbecam's Alidade. Capt. Robert Huntington, principal of the Atlantic School of Navigation, 150 State St., Boston, Mass., has published a little book on the subject and the booklet issued by Mr. How contains excerpts from Mr. Huntington's book. With the aid of Arbecam's Alidade it is represented that every master can be his own compass adjuster and that it should be on every ship worth insuring.

Attention is called to United States Patent No. 811,520, issued on January 30th, 1906. This patent relates to horizontal-vertical types of steam engines, and was granted, after long deliberation and controversy in the patent office, on an application filed in August, 1900, by Mr. Edwin Reynolds, and was assigned by him to Allis-Chamers Co. The claims under this patent broadly embrace the dominating or basic principles pertaining to the invention of horizontal-vertical types of steam engines, and notice is hereby given that the Allis-Chalmers Co. will fully protect and enforce its rights under this patent, against all infringers, and both the public and manufacturers are hereby warned against purchasing from unlicensed manufacturers, using or manufacturing steam engines, embodying an infringement of these rights.

The Abner Doble Co., of San Francisco, Cal., has just put out a new catalog entitled Doble Tangential Water Wheels, being the first comprehensive catalog relating to its hydraulic products that the company has issued. The first portion of the catalog contains general matter descriptive of the water wheels, special attention being paid to the Doble needle regulating nozzles, ellipsoidal buckets, ring-oiling bearings, nickel-steel shafts, etc. The illustrations of the different types of water wheels are followed by descriptions and some of the typical hydro-electric power plants in which Doble water wheels are operating. The latter portion of the book contains the Doble water wheel tables covering all conditions of water power up to a head of 2,550 ft. and in capacities up to 5,000 H. P. Other tables relate to the loss of head in pipe by friction, riveted steel pipe, etc. and four pages contain useful hydraulic information. The last seven pages are devoted to a series of ready conversion factors, most of which have been compiled from a recent work by Carl Hering. The company will be pleased to send copies of this catalog to persons interested in water power development.

Messrs. Purdy & Collison of City Island have laid the keel of a 67 ft. trunk cabin gasoline launch from designs by Cox & Stevens, and they expect to make delivery by May first. This vessel will have a 50 H. P. Standard motor and will be very handsomely finished. She will be used on the Maine coast.

At Lawley's Yard, South Boston, work is being pushed rapidly on the 150 ft. steam yacht for Roswell Eldridge, from the designs of Messrs. Cox & Stevens. It is expected that the vessel will be turned over to her owner in July.

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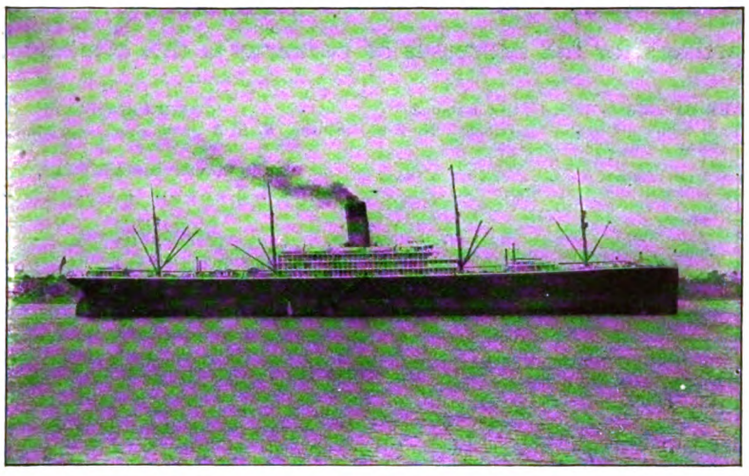
Hyde Windlasses and Capstans



Steamship Minnesota equipped with Hyde Windlass and Capstans.

Selected for the Minnesota and Dakota of the Great Northern Steamship Co.'s fleet—the largest vessels ever built in the United States. They are also being installed on nearly all of the vessels now building for the Navy Department, Revenue Cutter service, Lighthouse Board and the United States Coast Survey.

Reason—Their Superiority

Send for Illustrated Catalog.

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DIRECT REPRESENTATIVE OF LEADING AMERICAN AND FOREIGN UNDERWRITERS

THE
BOURNE-FULLER CO.
IRON STEEL
PIG IRON
COKE
Cleveland, Ohio.

SAFETY AT SEA

in time of danger depends upon the closure of the ship's bulkhead doors. A long series of maritime disasters shows that this can only be accomplished by means of

THE "LONG-ARM" SYSTEM

By this system, consisting of a central emergency station from which power doors and hatch-plates are unfailingly controlled, the electric motor does the work, leaving nothing to chance or individual initiative and bravery. Adopted after searching tests for use on 36 vessels of the United States Navy. *Further information may be obtained from*

The "Long-Arm" System Co., Ceveland, O.

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Buyers' Directory of the Marine Trade

For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by The Marine Review, Cleveland.

See accompanying index of Advertisers for full addresses of concerns in this directory.

AIR COMPRESSORS, AIR HOISTS, ETC.
Great Lakes Engineering Works.....Detroit.
Mietz, Aug. .....New York.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co.....New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.

ANCHORS.
Bowers, L. M. & Co.....Binghamton, N. Y.

ANTI-FRICTION METALS.
Cramp, Wm. & Sons.....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit
Great Lakes Engineering Works.....Detroit

ASH EJECTORS.
Great Lakes Engineering Works.....Detroit.

ATTORNEYS AND PROCTORS IN ADMIRALTY.
Gilchrist, Albert J.....Cleveland.
Goulder, Holding & Masten.....Cleveland.
Hoyt, Dustin & Kelley.....Cleveland.
Jenkins, Russell & Eichelberger....Cleveland.
Kremer, C. E.....Chicago.
MacDonald, Ray G.....Chicago.
Shaw, Warren, Cady & Oakes.....Detroit.
White, Johnson, McCaslin & Cannon Cleveland

BAROMETERS, MARINE GLASSES, ETC.
Ritchie, E. S. & Sons.....Brookline, Mass.

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Cleveland Block Co.....Cleveland.

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Power Specialty Co.....Detroit.

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Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, David.....New York.
Lane & DeGroot....Long Island City, N. Y.
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Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P. & Co. Winthrop Harbor, Ill.

BOILER CLEANING DEVICE.
Power Specialty Co.....Detroit.

BOILER COMPOUNDS.
The Bird-Archer Co..... New York
Dearborn Drug & Chemical Works....Chicago.

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Almy Water Tube Boiler Co..Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Detroit Ship Building Co.....Detroit.
East End Boiler Works.....Detroit.
Fletcher, W. A. & Co.....Hoboken, N. J.
Fore River Shipbuilding Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Works....
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Maryland Steel Co.....Sparrows Point, Md.
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Shipowners Dry Dock Co.....Chicago.
Superior Ship Building Co....Superior, Wis.
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WANTED and FOR SALE Department.

PROPOSALS.

PROPOSALS FOR TWO SNAGBOATS.—U. S. Engineer Office, Vicksburg, Miss., Jan. 8, 1906. Sealed proposals, in triplicate, for construction and delivery of two steel snagboats will be received here until 12 noon, standard time, March 10, 1906, and then publicly opened. Information furnished on application. G. M. Hoffman, Capt. Engineers.

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For Lease of Dredge, Tug and Scows.

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One dipper dredge, Bucket 4 to 5 C. Y.
Two scows 500 C. Y. capacity.
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Five Scotch Boilers, allowed 160 lbs. steam. Good as new. ERIE MACHINERY CO., 729 Garfield Bldg., Cleveland, O.

FOR SALE.

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A harbor and towing tug; engines 20 by 22; draft 6 ft. forward, 10 ft. aft. The boiler, hull and house brand new. In perfectly good condition, ready for immediate service.

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We offer for sale at a bargain, a Steam Barge, carries 250 tons.

Address HOLMES BROS.,
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For Sale.
LUMBER CARRIERS

Steamer Sachem, 650,000 ft. Barge Geo. B. Owen, 1,000,000 feet, light draft. For further information apply to

L. S. SULLIVAN, Toledo, Ohio.

FOR SALE.

A Bargain.

Steamer E. F. Gould, length 137 ft., width 28 ft, depth 8 ft. 5 in., tonnage 261 tons. Boiler, engine and hull in good condition. First-class, complete sand pumping outfit now installed on boat, will sell with boat if so desired. Apply

JOHN M. McKERCHEY,
Detroit, Mich.

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Steel Steamer.

Wanted to buy steel steamer or controlling interest in one.

Address Box 94, MARINE REVIEW, Cleveland, O.

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Wanted a small dredge that will work in about three feet of water.

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General Electric Co.....Schenectady, N. Y.
Mietz, Aug. .....New York.
Thropp & Sons, John E.....Trenton, N. J.

ENGINE BUILDERS, MARINE.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Detroit Ship Building Co.....Detroit.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Shipbuilding Co....Quincy, Mass.
Great Lakes Engineering Works.Detroit, Mich.
Hall Bros. .....Philadelphia.
Lockwood Mfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrows Point, Md.
Mietz, Aug.....New York.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher, Chas. D.....New York.
Moulton Steering Engine Co.....New York.
Newport News Ship Building Co.....
.....Newport News, Va.
New York Shipbuilding Co....Camden, N. J.
Nortawestern Steam Boiler & Mfg. Co...
..... Duluth, Mich.
Quintard Iron Works Co.....New York.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
Thropp, J. E. & Sons Co.....Trenton, N. J.
Trout, H. G.....Buffalo.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.
Cory, Chas. & Son.....New York.
Marine Mfg. Supply Co.....New York.

ENGINEERING SPECIALTIES AND SUPPLIES.
Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
Northwestern Steam Boiler & Mfg. Co...
..... Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.
Hynd, Alexander .....Cleveland.
Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph.....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Roelker, H. B. .....New York.
Wood, W. J. .....Chicago.

FEED WATER PURIFIERS AND HEATERS.
Greacen-Derby Engineering Co.....
.....Perth Amboy, N. J.
Ross Valve Co.....Troy, N. Y.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.
General Electric Co.....Schenectady, N. Y.

FORGES.
Sutton Co., C. E.....Toledo, O.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.
Cleveland City Forge & Iron Co...Cleveland.
Fore River Shipbuilding Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.
Fix's, S. Sons.....Cleveland.

FUELING COMPANIES AND COAL DEALERS.
Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Parker Bros. Co., Ltd.....Detroit.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Smith, Stanley B., & Co.....Detroit.
Smith Coal & Dock Co., Stanley B. Toledo, O.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

GAS BUOYS.
Safety Car Heating & Lighting Co..New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.

GAUGES, STEAM AND VACUUM.
Lunkenheimer Co. .....Cincinnati.

GAUGES, WATER.
Lunkenheimer Co. .....Cincinnati, O.

GENERATING SETS.
General Electric Co.....Schenectady, N. Y.

GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J

GREASE EXTRACTORS.
Greacen-Derby Engineering Co.....
.....Perth Amboy, N. J.

HAMMERS, STEAM.
Chase Machine Co.....Cleveland.

HEATING APPARATUS.
Sutton Co., C. E.....Toledo, O.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co..... Grand Haven, Mich.
General Electric Co.....New York.
Georgian Bay Engineering Works.....
.....Midland, Ont.
Hyde Windlass Co.....Bath, Me.
Marine Iron Co.....Bay City.
Mietz, Aug. .....New York.

HOLLOW SHAFTINGS, IRON OR STEEL.
Falls Hollow Staybolt Co...Cuyahoga Falls, O.

HOLLOW STAYBOLT IRON.
Falls Hollow Staybolt Co...Cuyahoga Falls, O.

HYDRAULIC DREDGES.
Great Lakes Engineering Works.....Detroit.

HYDRAULIC TOOLS.
Watson-Stillman Co., The.....New York.

ICE MACHINERY.
Great Lakes Engineering Works.....Detroit.
Roelker, H. B.....New York.

INJECTORS.
American Injector Co.....Detroit.
Jenkins Bros. .....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co.....Detroit, Mich.

INSURANCE, MARINE.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., E. J.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A.....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Peck, Chas. E. & W. F..New York & Chicago.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

IRON CASTINGS.
Sutton Co., C. E.....Toledo, O.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland, O.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.
Truscott Boat Mfg. Co.....St. Joseph, Mich.

LIFE PRESERVERS, LIFE BOATS, BUOYS.
Armstrong, Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIGHTS, SIDE AND SIGNAL.
Russell & Watson .....Buffalo.

LOGS.
Nicholson Ship Log Co.....Cleveland.
Walker & Sons, Thomas....Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J.

LUBRICATORS.
Lunkenheimer Co. .....Cincinnati

LUMBER.
Martin-Barriss Co.....Cleveland.

MACHINISTS.
Chase Machine Co.....Cleveland.
Hickler Bros.....Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....East Boston, Mass.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MARINE RAILWAYS.
Hickler Bros.....Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.
Crandall & Son, H. L....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.

MOTORS, GENERATORS—ELECTRIC
General Electric Co.....Schenectady, N. Y.

NAUTICAL INSTRUMENTS.
Benjamin Farnum How.....Boston
Ritchie, E. S., & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
Hynd, Alexander .....Cleveland.
Kidd, Joseph .....Duluth, Minn.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Wood, W. J. .....Chicago.

OAKUM.
Stratford, Oakum Co.....Jersey City, N. J.

OIL ENGINES.
Mietz, Aug. .....New York.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph..Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros. .....New York.
Katzenstein, L. & Co.....New York.
The National Metallic Packing Co....Oberlin, O.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co. .....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

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